Report on Public Hearings

Wuskwatim Generation and Transmission Projects

Commissioners Presiding:
Mr. Gerard Lecuyer, Chairperson
Dr. Kathi Avery Kinew
Mr. Robert Mayer
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September 2004

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Clean Environment Commission

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September 22, 2004

Honourable Stan Struthers
Minister of Conservation
Room 333 Legislative Building
450 Broadway Avenue
Winnipeg, MB

Minister

Re: Report on Public Hearing for the Wuskwatim Generation and Transmission Projects

On behalf of Dr. Kathi Avery Kinew, Messrs. Robert Mayer, Harvey Nepinak, Terry Sargeant and myself, the Wuskwatim Panel, I am pleased to submit the Clean Environment Commission's report on the public hearing with respect to the Wuskwatim Generation and Transmission Projects.

The Commission heard many points of view, some in support of the Wuskwatim Projects and some in opposition. It is the Commission's great pleasure to report that, in general, Participants respected the process and the points of view of others, which is a testament to the character of the individuals involved. The Commission would also like to recognize the Proponents, Manitoba Hydro-Electric Board and the Nisichawayasihk Cree Nation, as well as the Participants in the process for their hard work and patience throughout this ground-breaking process.

The Wuskwatim Projects represent the first hydroelectric development proposed in Manitoba since the early 1990s. The Generation Project is the first hydroelectric development in Manitoba structured as a partnership of a Crown corporation and a First Nation. The Wuskwatim Projects were also the first hydroelectric development to be subjected to a public hearing under *The Environment Act* of Manitoba and the first subject to a cooperative environmental assessment under the Canada-Manitoba Agreement on Environmental Assessment Cooperation.

With all these firsts comes a golden opportunity to learn and improve. Without the full cooperation and efforts of the Commission, the Proponents, the Participants, the Government of Manitoba and the Government of Canada, this opportunity may be lost. The comments and observations made in this report are meant to assist all parties when preparing future submissions and to create an environment for more efficient future proceedings.

The Commission recognizes that the Wuskwatim Projects are relatively small when compared to other potential hydroelectric projects in northern Manitoba. The fact that the effects of future projects may be considerably more significant underscores the need to improve filings and processes.

Additional development projects contemplated for the North will have significant implications for the region's existing infrastructure, housing, social services and other services. The Commission sees both a need and an opportunity for Manitoba to take a regional planning approach to ensure that all stakeholders are consulted and that future developments are implemented in a responsible and sustainable manner.

Chapters 6 and 7 in the attached report contain the direct responses to the tasks that were provided to the Commission in its terms of reference, including a series of recommendations. The Commission believes that the Minister may also wish to share this report and its recommendations with the Minister of Water Stewardship.

Sincerely,

Gerard Lecuyer, Chairperson

Clean Environment Commission Panel

Wuskwatim Generation and Transmission Project

Table of Contents

Letter of Transmittal i

Table of Contents iii

Executive Summary 1

1. Introduction 3
1.1 Manitoba Clean Environment Commission *3*
1.2 Wuskwatim Projects *3*
1.3 Terms of Reference *4*
1.4 Public Hearing *4*
1.5 Report *4*
1.6 Terminology, measurement and figures *5*
  1.6.1 Traditional Knowledge 5
  1.6.2 Imperial and Metric Units 5
  1.6.3 Figures and maps 5

2. The Licensing Process 6
2.1 Needed Licences and Approvals *6*
2.2 Manitoba Process for an Environment Act ***Licence*** *6*
2.3 Canada Process *7*
2.4 Federal-Provincial Cooperation *7*
2.5 Environmental Impact Statements *8*
2.6 The Licensing Process *9*

3. Public Hearing Process 10
3.1 Clean Environment Commission Panel *10*
3.2 Participation *10*
3.3 Public Notification *11*
3.4 Hearing Procedures *11*
3.5 Hearing Schedule *11*
3.6 Documentation *12*

4. Manitoba Hydro System 13
4.1 Overview *13*
  4.1.1 The Hydro Province 13
  4.1.2 Manitoba Hydro 13
4.2 Northern Hydroelectric Development *13*
  4.2.1 Background 13
  4.2.2 Lake Winnipeg Regulation 15
  4.2.3 Churchill River Diversion 15
  4.2.4 Augmented Flow Program 17
  4.2.5 Northern Flood Agreement 17
4.3 Transmission System *17*

5. Wuskwatim Projects Description 19
5.1 Background 19
5.2 Generation Project Description 19
  5.2.1 Overview 19
  5.2.2 Physical Description 20
  5.2.3 Project Construction 21
    5.2.3.1 Access Road 21
    5.2.3.2 Construction Camp and Facilities 22
    5.2.3.3 Construction Material Sources 22
    5.2.3.4 Schedule 22
    5.2.3.5 Workforce 23
    5.2.3.6 Waste Disposal 23
  5.2.4 Project Operation 23
    5.2.4.1 Generation Station 23
    5.2.4.2 Southern Indian Lake 25
    5.2.4.3 Lake Winnipeg Regulation 25
    5.2.4.4 Cross Lake 25
    5.2.4.5 Permanent Facility 26
  5.2.5 Decommissioning 26
  5.2.6 Commission Comments and Observations – Generation Project 26
5.3 Transmission Project 27
  5.3.1 Overview 27
  5.3.2 Physical Description 27
  5.3.3 Project Construction 28
    5.3.3.1 Design 28
    5.3.3.2 Contracting 28
    5.3.3.3 Construction Camps 30
    5.3.3.4 Stations 30
  5.3.4 Project Operation 30
  5.3.5 Decommissioning 30
  5.3.6 Commission Comments and Observations – Transmission Project 30

6. Justification: Need For and Alternatives To 31
6.1 Introduction 31
  6.1.1 Need For and Alternatives to the Projects 31
  6.1.2 Definitions of Justification, Need For and Alternatives To 31
  6.1.3 Previous Review of Wuskwatim and Other Hydroelectric Development 32
6.2 Business Structure 32
  6.2.1 Overview 32
  6.2.2 Summary of Understanding 32
  6.2.3 Fundamental Features 33
  6.2.4 Project Construction 33
  6.2.5 Adverse Effects 33
  6.2.6 Capital Requirements and Financing 34
  6.2.7 Power Purchase 34
  6.2.8 Power Supply and Management 34
  6.2.9 Pre-Project Training 35
  6.2.10 Employment and Business Opportunities 35
  6.2.11 Transmission Development Fund 36
  6.2.12 Peace of the Braves Agreement 36
  6.2.13 Participant Positions – Business Structure 36
  6.2.14 Presenter Positions – Business Structure 37
  6.2.15 Commission Comments and Observations – Business Structure 38

6.2.16 Commission Recommendations – Business Structure 39
6.3 Project Costs ***39***
6.3.1 Capital Costs 39
6.3.2 Production Costs 41
6.3.3 Participant Positions – Project Costs 42
6.3.4 Commission Comments and Observations – Projects Cost 42
6.3.5 Commission Recommendations – Project Costs 43
6.4 Export Market ***43***
6.4.1 Load Forecasting 43
6.4.2 Surplus Energy Available for Export 44
6.4.3 Export Demand 45
6.4.4 Forecast Export Price 45
6.4.5 Participant Positions – Export Market 47
6.4.6 Commission Comments and Observations – Export Market 47
6.5 Economic and Risk Evaluation ***48***
6.5.1 Economics and Internal Rate of Return 48
6.5.2 Risk Evaluation and Hurdle Rates 48
6.5.3 Sensitivity Analysis 49
6.5.4 Economic Conclusions by MH/NCN 49
6.5.5 Participant Positions – Economic and Risk Evaluation 50
6.5.6 Presenter Positions – Economic and Risk Evaluation 50
6.5.7 Commission Comments and Observations – Economic and Risk Evaluation 50
6.5.8 Commission Recommendations – Economic and Risk Evaluation 50
6.6 Financial Analysis ***50***
6.6.1 Impact on Net Income 51
6.6.2 Impact on Debt-to-Equity Ratio 52
6.6.3 Impact on Interest Coverage 52
6.6.4 Impact on Consumer Rates 52
6.6.5 Sensitivity Analysis 52
6.6.6 Participant Positions – Financial Analysis 53
6.6.7 Presenter Positions – Financial Analysis 53
6.6.8 Commission Comments and Observations – Financial Analysis 54
6.7 Resource Options ***54***
6.7.1 Screening Process 54
6.7.2 Hydro Options 56
6.7.3 Natural-Gas Options 57
6.7.4 Coal Options 57
6.7.5 Wind Options 58
6.7.6 Demand-Side Management (DSM) 60
6.7.7 Supply-Side Enhancement Projects (SSE) 61
6.7.8 Non-Utility Generation (NUG) 61
6.7.9 Imports 62
6.7.10 Other Options 62
6.7.11 MH/NCN's Overall Conclusions Regarding Resource Options 62
6.7.12 Participant Positions – Resource Options 63
6.7.13 Presenter Positions – Resource Options 65
6.7.14 Commission Comments and Observations – Resource Options 65
6.7.15 Commission Recommendations – Resource Options 66
6.8 Summary Conclusions ***66***

7. Environmental Impact Statements **68**
7.1 Introduction ***68***
7.2 Assessing the Projects ***69***
7.2.1 Previous Studies and Assessments 69
7.2.2 Concepts and Methodology 70
7.2.2.1 Sustainable Development 70
7.2.2.1.1 MH/NCN Position – Sustainable Development 70
7.2.2.1.2 Participant Positions – Sustainable Development 71
7.2.2.1.3 Commission Comments and Observations – Sustainable Development 71
7.2.2.2 Traditional Knowledge and Traditional Scientific Knowledge 72
7.2.2.2.1 MH/NCN Position – Traditional Knowledge 72
7.2.2.2.2 Participant Positions – Traditional Knowledge 73
7.2.2.2.3 Presenters Positions – Traditional Knowledge 73
7.2.2.2.4 Commission Comments and Observations – Traditional Knowledge 74
7.2.2.3 Valued Environmental Components 74
7.2.2.3.1 MH/NCN Position – Valued Environmental Components 74
7.2.2.3.2 Participant Positions – Valued Environmental Components 75
7.2.2.3.3 Commission Comments and Observations – Valued Environmental Components 75
7.2.2.4 Baseline Conditions 76
7.2.2.4.1 MH/NCN Position – Baseline Conditions 76
7.2.2.4.2 Commission Comments and Observations – Baseline Conditions 76
7.2.2.5 Thresholds 77
7.2.2.5.1 MH/NCN Position - Thresholds 77
7.2.2.5.2 Participants Positions - Thresholds 77
7.2.2.5.3 Commission Comments and Observations - Thresholds 77
7.2.2.6 Uncertainty 77
7.2.2.6.1 MH/NCN Position - Uncertainty 78
7.2.2.6.2 Participant Positions – Uncertainty 78
7.2.2.6.3 Commission Comments and Observations – Uncertainty 78
7.2.2.7 Significance 79
7.2.2.7.1 MH/NCN Position – Significance 79
7.2.2.7.2 Participant Positions – Significance 79
7.2.2.7.3 Commission Comments and Observations – Significance 80
7.2.2.8 Cumulative Environmental Effects 80
7.2.2.8.1 MH/NCN Position – Cumulative Environmental Effects 80
7.2.2.8.2 Participant Positions – Cumulative Environmental Effects 81
7.2.2.8.3 Commission Comments and Observations – Cumulative Environmental Effects 82
7.2.2.9 Environmental Protection Plans 83
7.2.2.9.1 MH/NCN Position – Environmental Protection Plans and Environmental Monitoring 83
7.2.2.9.2 Participant Positions – Environmental Protection Plans and Monitoring 84
7.2.2.9.3 Commission Comments and Observations – Environmental Protection Plans and Monitoring 85
7.2.2.10 Consultation 86
7.2.2.10.1 MH/NCN Position - Consultation 86
7.2.2.10.2 Participant Positions - Consultation 87
7.2.2.10.3 Presenter Positions – Consultation 88
7.2.2.10.4 Commission Comments and Observations - Consultation 88
7.2.3 Assessment of the Projects 89
7.2.3.1 Physical Effects 89
7.2.3.1.1 Hydrological Regime 89
7.2.3.1.1.1 MH/NCN Position – Hydrological Regime 89
7.2.3.1.1.2 Participant Positions – Hydrological Regime 90
7.2.3.1.1.3 Commission Comments and Observations – Hydrological Regime 91
7.2.3.1.2 Erosion 92
7.2.3.1.2.1 MH/NCN Position - Erosion 92
7.2.3.1.2.2 Participant Positions - Erosion 93
7.2.3.1.2.3 Commission Comments and Observations – Erosion 93

7.2.3.1.3 Suspended Solids *93*
7.2.3.1.3.1 MH/NCN Position – Suspended Solids *93*
7.2.3.1.3.2 Participant Positions – Suspended Solids *94*
7.2.3.1.3.3 Commission Comments and Observations – Suspended Solids *94*
7.2.3.1.4 Greenhouse Gases/Climate Change 95
7.2.3.1.4.1 MH/NCN Position - Greenhouse Gases/Climate Change *95*
7.2.3.1.4.2 Participant Positions - Greenhouse Gases/Climate Change *96*
7.2.3.1.4.3 Commission Comments and Observations – Greenhouse Gases/Climate Change *97*
7.2.3.2 Biological Effects 97
7.2.3.2.1 Woodland Caribou *97*
7.2.3.2.1.1 MH/NCN Position – Woodland Caribou *98*
7.2.3.2.1.2 Participant Positions – Woodland Caribou *99*
7.2.3.2.1.3 Commission Comments and Observations – Woodland Caribou *100*
7.2.3.2.2 Fish Productivity *100*
7.2.3.2.2.1 MH/NCN Position – Fish Productivity *100*
7.2.3.2.2.2 Participant Positions – Fish Productivity *101*
7.2.3.2.2.3 Commission Comments and Observations – Fish Productivity *101*
7.2.3.2.3 Protected Areas *101*
7.2.3.2.3.1 MH/NCN Position *102*
7.2.3.2.3.2 Participant Positions – Protected Areas *102*
7.2.3.2.3.3 Commission Comments and Observations – Protected Areas *102*
7.2.3.3 Socio-Economic Effects 103
7.2.3.3.1 MH/NCN Position - Socio-Economic Effects *103*
7.2.3.3.2 Participant Positions – Socio-Economic Effects *103*
7.2.3.3.3 Presenters Positions - Socio-Economic Effects *104*
7.2.3.3.4 Commission Comments and Observations – Socio-Economic Effects *106*
7.2.3.4 Cultural Effects 107
7.2.3.4.1 MH/NCN Position – Cultural Effects *107*
7.2.3.4.2 Participant Positions – Cultural Effects *108*
7.2.3.4.3 Presenters Positions – Cultural Effects *109*
7.2.3.4.4 Commission Comments and Observations – Cultural Effects *109*
7.2.4 Conclusion and Recommendations 109
7.2.4.1 Licensing Recommendations 110
7.2.4.2 Consultation Recommendations 114
7.3 The weight of the past: CRD, LWR, and the AFP ***114***
7.3.1 Participant Comments on CRD, LWR and AFP 115
7.3.2 Presenter Comments and Observations—CRD, LWR, and AFP 116
7.3.3 Commission Comments and Observations—CRD, LWR, and AFP 116
7.3.3 CRD, LWR, AFP Recommendations 117
7.4 Improving the Process ***118***
7.4.1 VECs 118
7.4.2 Baseline Conditions 119
7.4.3 Thresholds 119
7.4.4 Regional Planning 119
7.4.5 TSK 119
7.4.6 Cumulative-effects assessment 120
7.4.7 Improving the Process Recommendations 121

8. Recommendations **122**
Recommendation 6.1 ***122***
Recommendation 6.2 ***122***
Recommendation 6.3 ***122***
Recommendation 6.4 ***122***
Recommendation 6.5 ***122***

Recommendation 7.1 122
Recommendation 7.2 125
Recommendation 7.3 126
Recommendation 7.4 126
Recommendation 7.5 127
Recommendation 7.6 127
Recommendation 7.7 127
Recommendation 7.8 127
Recommendation 7.9 127
Recommendation 7.10 128

Appendix A: Terms of Reference 129
Background 129
Mandate of the Hearings 129
Scope of the Review 129

Appendix B: Participants/Presenters 131

Appendix C: Financial Data 135

Appendix D: Acronyms 137

Appendix E: Glossary 140

Executive Summary

In April 2003, the Minister of Conservation requested that the Manitoba Clean Environment Commission conduct a public hearing into the Wuskwatim Generation Project and the Wuskwatim Transmission Line Project (the Projects) that have been proposed by the Manitoba Hydro-Electric Board and the Nisichawayasihk Cree Nation.

The Commission was mandated to consider:

1. First, the justification, need for and alternatives to the Projects, and
2. Second, the potential environmental, socio-economic and cultural effects of the construction and operation of the Projects.

The Commission was further requested to provide a report to the Minister of Conservation pursuant to requirements of *The Environment Act*.

The Commission conducted the hearing from March 1 to June 9, 2004.

The Commission believes that Manitoba Hydro and Nisichawayasihk Cree Nation have adequately justified the Projects and is satisfied that the Projects are economic. The Commission believes that adequate evidence was presented to allow it to determine that, if the appropriate mitigation and monitoring regime is put in place and the Projects are constructed and operated as proposed, the adverse effects on the biophysical, socio-economic and cultural environment will not be significant. If managed and developed in an appropriate manner, the benefits for Aboriginal people, northerners, and all Manitobans could be significant. For these reasons, the Commission is recommending the licensing of the project subject to a series of terms and licensing conditions.

Through the hearing process the Commission was made aware of a range of issues relating to the Churchill River Diversion, Lake Winnipeg Regulation and the Augmented Flow Program. While these issues were not under direct consideration, the Commission believed that it appropriate to make a number of recommendations relating to these issues.

Finally, the Commission has made a number of other recommendations for improvement in the process of determining the needs for, the alternatives to, and environmental impacts of future hydroelectric generation projects.

1. Introduction

1.1 Manitoba Clean Environment Commission

The Manitoba Clean Environment Commission (the Commission) is an arms-length provincial agency established under the authority of *The Environment Act* of Manitoba. The Commission encourages and facilitates public involvement in environmental matters, and offers advice and recommendations to the Government of Manitoba on sustainable development, environmental issues and licensing matters. Its mandate is exercised through public hearings, investigations, mediation and education. The Commission consists of a full-time Chairperson and part-time Commissioners appointed by Order-in-Council.

1.2 Wuskwatim Projects

The proposed Wuskwatim Generation and Transmission Projects (the Projects) consist of a generation station and associated transmission facilities (Figure 1.1). The Wuskwatim Generation Project (the Generation Project) is a 200-megawatt (MW) low-head, modified run-of-the-river hydroelectric plant on the Burntwood River at Taskinigup Falls, located approximately 45 km southwest of Thompson and 35 km southeast of Nelson House. The Wuskwatim Transmission Project (the Transmission Project) consists of three transmission-line segments, one 230-kilovolt (kV) transmission line from Wuskwatim to the Birchtree Station near Thompson, two 230-kV transmission lines from Wuskwatim to the existing Herblet Lake Station near Snow Lake, and one 230-kV transmission line from Herblet Lake to the existing Rall's Island Station at The Pas. The Projects are described in detail in the Needs For and Alternatives To

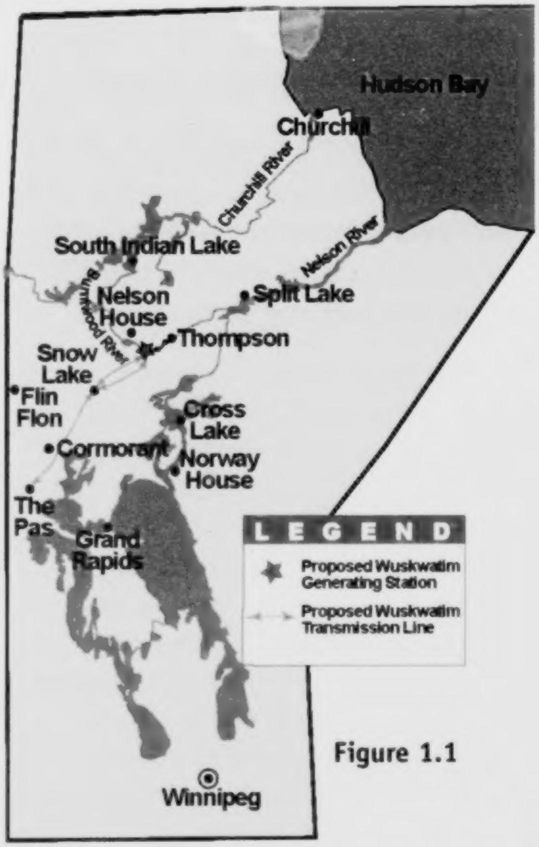

Figure 1.1

1. Introduction

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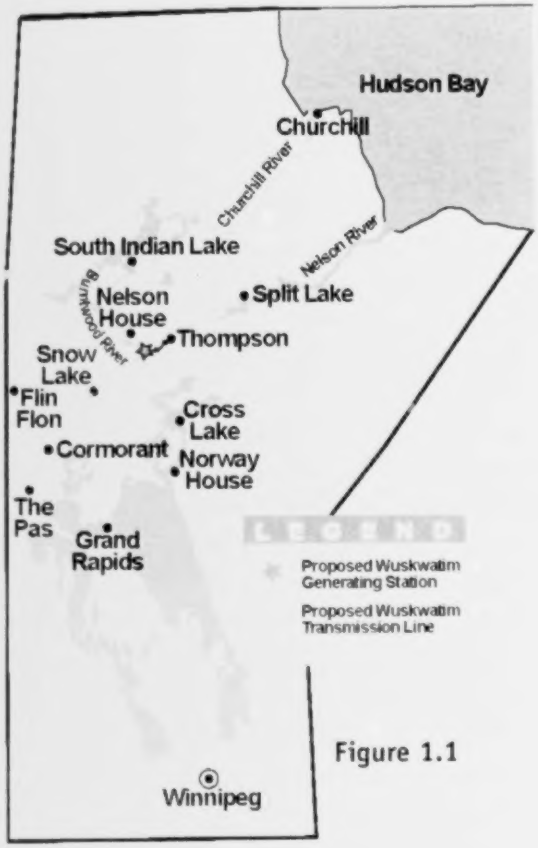


Figure 1.1

(NFAAT) and Environmental Impact Statement (EIS) sections of this report (Chapters 6 and 7 respectively).

The proponents of the Projects, Manitoba Hydro-Electric Board (MH) and the Nisichawayasihk Cree Nation (NCN) are considering a partnership for the development of the Generation Project. Under a 2001 agreement in principle (AIP) NCN may own up to 33% of the generation station and would be entitled to a proportionate share of operating profits. MH would develop and solely own the Transmission Project. The proposed partnership would be known as the Wuskwatim Power Partnership.

1.3 Terms of Reference

In April 2003, the Minister of Conservation issued terms of reference to the Manitoba Clean Environment Commission (Appendix A) to conduct a public hearing into the Projects. The Commission was mandated to consider:

1. First, the justification, need for and alternatives to the Projects, and
2. Second, the potential environmental, socio-economic and cultural effects of the construction and operation of the Projects.

The first issue, which is referred to in this document as the Needs For and Alternatives To (NFAAT) issue, touches on issues that are often seen to be in the purview of the Manitoba Public Utilities Board (PUB) rather than the Commission. The second issue, the potential environment, socio-economic and cultural effects, is much more clearly within the Commission's traditional mandate. In order to accommodate this broadened mandate, two members of the PUB were appointed to the Commission and to the panel that conducted these hearings.

The Commission was requested to conduct the review in accordance with its Process Guidelines Respecting Public Hearings and to provide a report to the Minister of Conservation pursuant to requirements of *The Environment Act*. The terms of reference stated that the Commission's public hearing would be part of a cooperative Manitoba-Canada review of the Projects that is currently underway.

1.4 Public Hearing

In accordance with the terms of reference, the Commission conducted a public hearing into the Projects. Thirty-two days of hearings were held in Winnipeg, Thompson and The Pas (Opaskwayak Cree Nation (OCN)), Manitoba from March 1 to June 9, 2004. MH and NCN, funded and non-funded Participants (described in more detail in Chapter 3), government regulators, First Nation representatives and members, other Aboriginal organizations, and the general public made presentations to and were questioned by the Commission.

1.5 Report

This report to the Minister of Conservation reviews the issues raised by the filings and hearings and makes recommendations on both the justification, need for and alternatives to the Projects, and the potential environmental, socio-economic and cultural effects of the construction and operation of the Projects. Specific recommendations are provided with respect to licensing of the Projects and the terms and conditions under which adverse environmental effects might be mitigated and residual effects managed.

Separate chapters deal with the following topics.

- Chapter 2: The Licensing Process
- Chapter 3: Public Hearing Process
- Chapter 4: The Manitoba Hydro System
- Chapter 5: Wuskwatim Projects
- Chapter 6: Justification, Need For and Alternatives To
- Chapter 7: Environmental Impact Statement
- Chapter 8: Recommendations

Additional information on the public hearing, a list of participants, a list of acronyms and a glossary of terms is provided in the Appendices.

1.6 Terminology, measurement and figures

1.6.1 Traditional Knowledge

The EIS Guidelines use the term Traditional Ecological Knowledge (TEK), while MH/NCN used the term Traditional Knowledge (TK) in the EIS documents. NCN considers Traditional Knowledge to be the observation and experience of the land; Aboriginal law regarding how the environment works; the understanding of NCN's place in the world (how things are connected, including spiritually, and the relationship to the land); the goals and aspirations of NCN; the outlook on the proposed Projects (concerns, acceptability); NCN's identity and culture; the stewardship of the land, and a basis for natural resource management. NCN believes that traditional knowledge comes from Elders and others, both traditional and modern. In this report the Commission uses the terms Western Scientific Knowledge (WSK) and Traditional Scientific Knowledge (TSK) and accords them equal importance and value throughout the report. TSK is scientific knowledge held by Aboriginal or indigenous peoples around the world. It is based upon an intimate connection with the lands and waters, oral tradition since time immemorial, and draws upon the people's spiritual connectedness. WSK is scientific knowledge accumulated by systematic study using the scientific method and organized by general principles.

Because the Commission has concluded that TSK is a more appropriate and useful term, it has used it when describing what participants referred to as Traditional Knowledge.

1.6.2 Imperial and Metric Units

While it is standard practice to express distances, elevation, volumes, flows and other related measurements in metric units, imperial units have been used in this report where they have been taken directly from a legal document such as a regulation or a licence, and where they are still in prevalent use.

1.6.3 Figures and maps

Unless otherwise indicated, all figures and tables in this report were provided by MH/NCN or compiled from information provided by MH/NCN.

2. The Licensing Process

2.1 Needed Licences and Approvals

The construction and operation of the proposed Projects will require a variety of licences from both the Government of Canada and the Government of Manitoba. Both Projects require licences under *The Environment Act* of Manitoba, while the Generation Project requires an interim licence under *The Water Power Act* for construction of the Generation Project. The Transmission Project requires a provincial licence under *The Crown Lands Act*. The Generation Project also requires federal authorizations under the *Fisheries Act* for the harmful alteration, disruption and destruction of fish habitat and use of explosives near water and a permit under the *Navigable Waters Protection Act*.

Table 2.1 below describes the status of the Proponents' applications for the main licenses and permits that will be required for the Projects.

2.2 Manitoba Process for an *Environment Act* Licence

The Environment Act outlines Manitoba's environmental assessment and licensing process for developments with the potential for significant environmental effects. The Classes of Development Regulation lists development classes that require a licence prior to construction and operation. The

Table 2.1

Licence/Permit	**Status**
Water Power Act authorization	The Water Branch is currently reviewing the application filed by MH/NCN on June 4, 2003
Fisheries Act authorizations	MH/NCN is expected to file a draft application with DFO
Navigable Waters Protection Act approval	MH/NCN was expected to submit application forms
Crown Lands permits (including construction permits and quarry permits)	Requirements are being determined
Water Rights licence for main site start-up camp, road start-up and the main camp	Application will be prepared to meet the construction schedule
Sewage Treatment Plant Licenses for start-up camp and main camp	Application will be prepared to meet the construction schedule
Waste Disposal Grounds license	Application will be prepared to meet the construction schedule
Registration of Domestic Water Systems for the start-up and main camp	Systems will be registered to meet the construction schedule
Work permits	Permits will be acquired before construction work commences

Generation Project is a Class 3 development requiring approval by the Minister of Conservation. The Transmission Project is a Class 2 development requiring approval by the Director of Environmental Approvals for Manitoba Conservation. The Licensing Procedures Regulation defines a five-step environmental assessment process that includes: 1) filing a proposal with the Director of Environmental Approvals, 2) screening of the proposal by Manitoba Conservation, 3) provision of further information, 4) public hearings and 5) a licensing decision. Steps 3 and 4 are discretionary.

2.3 Canada Process

Because the Generation Project requires federal authorizations under the *Fisheries Act* and the *Navigable Waters Protection Act*, it must undergo a comprehensive study as described by the *Canadian Environmental Assessment Act*. The Transmission Project does not require this level of assessment. A comprehensive study is an environmental assessment that considers environmental effects, mitigation measures, public concerns, significance, the purpose of the project, alternative means of carrying out the project, need for a follow-up program, and sustainability of natural resources. The Department of Fisheries and Oceans (DFO) has responsibility for carrying out the comprehensive study of the Generation Project. DFO is planning to complete its assessment after the Commission's report is submitted to the Minister of Conservation. The Comprehensive Study Report will be submitted to the Federal Minister of Environment for further public review and approval. It will then be determined whether to refer the Generation Project to a review panel under Section 29 of the *Canadian Environmental Assessment Act*.

2.4 Federal-Provincial Cooperation

Under the Canada-Manitoba Agreement for Environmental Assessment Cooperation (CMAEAC), projects that require environmental assessment by both Canada and Manitoba are to undergo a single cooperative environmental assessment, administered by both governments. One level of government takes the lead in administering the assessment, but both levels are full and active partners. In the case of the Projects, the Government of Manitoba has played the lead role.

A Project Administration Team (PAT), consisting of senior representatives from Manitoba Conservation, DFO and the Canadian Environmental Assessment Agency (CEAA), managed the cooperative environmental assessment process for the Projects. Responsibilities of the PAT included coordinating public consultations, establishing a mutually agreeable schedule, setting information requirements, and assessing completeness of the assessment report.

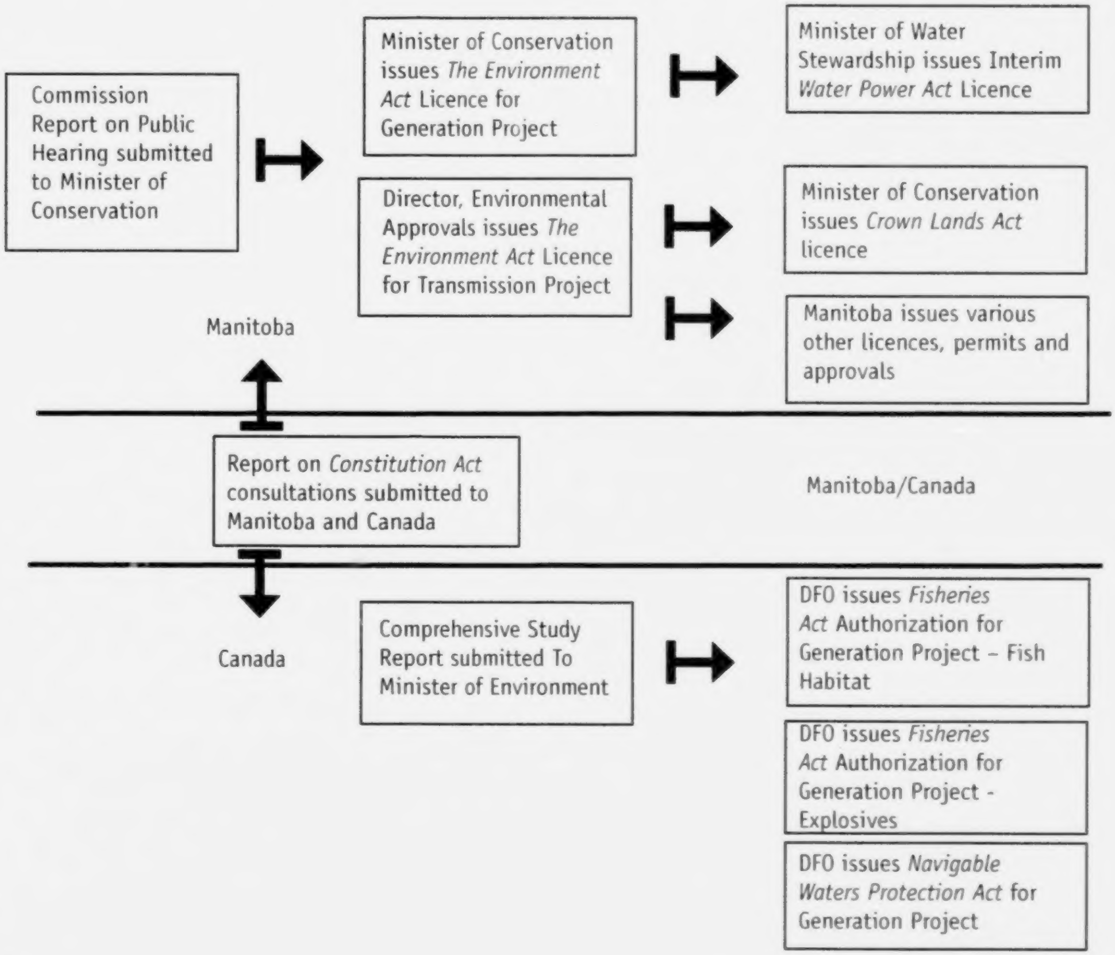
Early in the assessment process, Manitobans were informed that the Wuskwatim Projects were to be the subject of a cooperative environmental assessment process between Manitoba and Canada. During the hearing, several participants advised that they found the process confusing and were unable to determine the nature and extent of the so-called "cooperative" effort, particularly with respect to the actual participation of federal departments or agencies in the assessment of the Projects. The Commission agrees that the cooperative assessment process in Manitoba is not easily understood and found little evidence of its practical application during the review of the

Wuskwatim Projects. The Commission realized little benefit from the cooperative approach that was apparently undertaken in connection with this review. The Commission notes, for example, that while federal representatives participated in a number of pre-hearing proceedings, they chose not to involve themselves actively during the actual hearing.

2.5 Environmental Impact Statements

MH/NCN submitted separate proposal forms under *The Environment Act* to Manitoba Conservation for the Projects on December 7, 2001. Subsequently, the PAT prepared draft EIS Guidelines for the Projects based on scoping documents prepared in cooperation with MH and NCN. The draft guidelines were subjected to public and technical reviews, and the Commission convened public meetings on the guidelines during January and February 2002. The Commission's report on the draft guidelines outlined 19 recommendations to the Minister of Conservation on a variety of matters including scope, prescriptiveness, standards, methods, baseline conditions and cumulative effects. The PAT subsequently issued final EIS guidelines in late April 2002. On April 30, 2003, MH and NCN presented separate EIS submissions for the Class 3 Generation Project and the Class 2

Figure 2.1 (Source Manitoba Clean Environment Commission)


Commission Report on Public Hearing submitted to Minister of Conservation
Minister of Conservation issues *The Environment Act* Licence for Generation Project
Minister of Water Stewardship issues Interim *Water Power Act* Licence
Director, Environmental Approvals issues *The Environment Act* Licence for Transmission Project
Minister of Conservation issues *Crown Lands Act* licence
Manitoba issues various other licences, permits and approvals
Manitoba
Report on *Constitution Act* consultations submitted to Manitoba and Canada
Manitoba/Canada
Canada
Comprehensive Study Report submitted To Minister of Environment
DFO issues *Fisheries Act* Authorization for Generation Project – Fish Habitat
DFO issues *Fisheries Act* Authorization for Generation Project - Explosives
DFO issues *Navigable Waters Protection Act* for Generation Project

Transmission Project, as well as documents that considered the Need For and Alternatives To the Projects.

2.6 The Licensing Process

Upon receipt of the Commission's report on the public hearing, the Minister of Conservation will decide whether licences should be issued under *The Environment Act* for the Projects (Figure 2.1). Licensing decisions by Manitoba's Minister of Water Stewardship and Canada's Minister of Fisheries and Oceans will also take into account the report on consultations with potentially affected First Nations conducted by Manitoba and Canada under Section 35 of the *Constitution Act.*

Subsequent to licensing the Generation Project, MH has stated that it will apply for a final licence under *The Water Power Act* for the Churchill River Diversion (CRD) that would include operating provisions of the Augmented Flow Program (AFP).

3. Public Hearing Process

3.1 Clean Environment Commission Panel

The panel assigned to conduct the public hearing on the Projects consisted of Mr. Gerard Lecuyer (Chairperson), Dr. Kathi Avery Kinew, Mr. Harvey Nepinak, Mr. Robert Mayer, and Mr. Terry Sargeant. All five hold appointments to the Commission as commissioners. Dr. Avery Kinew and Mr. Mayer are also members of the Manitoba Public Utilities Board (PUB).

3.2 Participation

This report makes use of two terms to describe members of the public who participated in the hearing process: Participants and Presenters. Participants were organizations and their representatives who were involved in both the Pre-Hearing Processes (see below) and the formal hearing proceedings. Aside from making presentations at the hearing, many Participants retained experts to make submissions, and participated in the questioning of those who made presentations. Presenters were organizations and members of the public who attended and spoke only during the formal hearing proceedings. The following organizations were classified as Participants in the process.

- Boreal Forest Network (BFN)
- Community Association of South Indian Lake (CASIL)
- Consumers' Association of Canada/Manitoba Society of Seniors (CAC/MSOS)
- Displaced Residents of South Indian Lake (DRSIL)
- Manitoba Future Forest Alliance (MFFA)
- Manitoba Industrial Power Users Group (MI-PUG)
- Manitoba Métis Federation (MMF)
- Manitoba Wildlands-Canadian Nature Federation (CNF)
- Mosakahiken Cree Nation (MCN)
- Opaskwayak Cree Nation (OCN)
- O-Pinon-Na-Piwin-Cree Nation (OPCN)
- Pimicikamak Cree Nation (PCN)
- Provincial Council of Women of Manitoba (PCWM)
- Pukatawagan Fishermen's Association (PFA)
- Tataskweyak Cree Nation (TCN)
- Time to Respect Earth's Ecosystems/Resource Conservation Manitoba (TREE/RCM)
- Trap Line No. 18
- York Factory First Nation (YFFN)

Appendix B lists all registered Presenters.

Participant Assistance Program

The Environment Act's Participant Assistance Regulation establishes a proponent-funded participant assistance program that ensures that qualifying public organizations have access to resources to properly participate in hearings of this nature. In June 2003, the Minister of Conservation requested that a Commission Participation Assistance Committee consider applications received for funding. In July, 2003, the Committee recommended that $876,438 be awarded to the following 11 Participants:

- Community Association of South Indian Lake
- Consumers' Association of Canada/Manitoba Society of Seniors
- Manitoba Métis Federation
- Manitoba Wildlands-Canadian Nature Federation
- Mosakahiken Cree Nation
- Opaskwayak Cree Nation
- Pimicikamak Cree Nation
- Pukatawagan Fishermen's Association
- Time to Respect Earth's Ecosystems/Resource Conservation Manitoba
- Trap Line No. 18
- York Factory First Nation

3.3 Public Notification

Notice of the Commission Wuskwatim public hearing was first issued as a Government of Manitoba news release. Subsequently, the Commission announced hearing dates and locations to the media, and placed notices in Winnipeg, Thompson and The Pas newspapers. Notices for additional hearing dates were distributed to the Participants by e-mail. In addition, public hearing notices were mailed to government offices, businesses, organizations and individuals on the Commission's mailing list. Notices of the hearing were also posted on the web sites of Manitoba Conservation and the Commission.

3.4 Hearing Procedures

The Commission conducted the public hearing in accordance with its *Process Guidelines Respecting Public Hearings.* A pre-hearing conference was held with the Participants, MH, NCN and the PAT on July 28, 2003, to discuss procedural matters including hearing logistics and scheduling. The Commission heard motions from Participants regarding the scope of the review on September 30, 2003, and to consider outstanding disclosure matters on January 23, 2004. The Commission coordinated two rounds of written questions to MH/NCN, one round of written questions to the Participants, and one round of written questions to the PAT. (This was referred to as the Interrogatory Process.) Substantive documentation and witness lists were also submitted prior to the commencement of the hearing.

The public hearing commenced in Winnipeg with welcoming remarks by the Commission Chair, presentations by Manitoba Conservation on the environmental assessment and licensing process, and presentations by MH/NCN on the NFAAT and the EIS for the Projects. MH/NCN assembled two panels, one for the project description and the NFAAT portion of the hearings and one for the EIS portion. The Commission and the Participants cross-examined MH/NCN, first on the NFAAT, and second on the EIS on the Projects. MH/NCN were provided opportunities for re-examination after the cross-examination was completed.

3.5 Hearing Schedule

The public hearing was convened in Winnipeg on March 1 to 3, 8 to 10, and 15 to 19, April 6 to 8 and 13 to 15, May 11 to 14 and 25 to 28, and June 7 to 9, 2004. Hearing dates in Thompson were March 22 and 23, and in The Pas (OCN) were March 25 and 26, 2004.

3.6 Documentation

Information on the Projects was made available to the public through the Commission, Manitoba Conservation and MH web sites. Documentation was transmitted among the Participants electronically via e-mail, compact disc, and in hard copy. Documents on the Projects, including the NFAAT and EIS, were filed at 14 Manitoba Conservation public registry locations. In addition, DFO established a public registry at the Freshwater Institute in Winnipeg as a repository for information relevant to the comprehensive study report that it is preparing.

An extensive amount of evidence and information was filed as part of the record of the public hearing including the EIS documents, supplemental filings, interrogatory responses, participant submissions, exhibits, undertakings and 7,705 pages of transcripts. Much of this information was also made available to the public on the web sites of Manitoba Conservation, MH, Manitoba Wildlands and Reid Reporting Services.

4. Manitoba Hydro System

4.1 Overview

4.1.1 The Hydro Province

With more than 95% of its electricity coming from water energy, Manitoba is rightly known as the Hydro Province. The Hudson Bay watershed, which drains an area of about 3,861,400 km^2 into Hudson Bay, is the source of this generating capacity. Over 70% of the flow in Manitoba's waterways originates outside the province. All of the major rivers in the Prairies region flow into Manitoba's lowlands, giving Manitoba 90% of the region's hydroelectric potential. The Nelson, Churchill, Seal and Hayes Rivers carry more than 99% of the water flowing from Manitoba into the Hudson Bay. Over 60% of this flow is carried by the Nelson River alone. Less than 50% of this hydroelectric potential has been developed.

4.1.2 Manitoba Hydro

The Manitoba Hydro-Electric Board is a provincial Crown corporation that provides electricity to over 500,000 customers spread over a service territory of 650,000 km^2. MH's 14 hydroelectric generation stations on the Winnipeg, Saskatchewan, Nelson and Laurie Rivers produce approximately 5,000 MW. Electricity may also be generated at a coal- and natural-gas fired thermal generation station at Brandon and/or a gas-fired thermal generation station at Selkirk. Four remote northern communities are served by on-site diesel generation. Total generation capacity is currently in the order of 5,400 MW. (For details, see Figure 4.1)

4.2 Northern Hydroelectric Development

4.2.1 Background

The potential of the Nelson River for hydroelectric generation has been recognized since the early 1900s. Subsequent to joint federal-provincial engineering and economic studies carried out in the early to mid-1960s, MH announced its intention to maximize power production on the lower Nelson River by regulating the level of Lake Winnipeg and diverting the Churchill River into the Nelson River via the Rat and Burntwood River system. Canada and Manitoba established the Lake Winnipeg, Churchill and Nelson Rivers Study Board in 1971 to investigate the sociological, economic and environmental aspects of Lake Winnipeg Regulation (LWR), the Churchill River Diversion (CRD) and the development of hydroelectric potential of the lower Nelson River. In November 1970 and December 1972 respectively, the Water Resources Branch of the Manitoba Department of Mines, Resources

Figure 4.1

Manitoba Hydro Generation and Transmission System

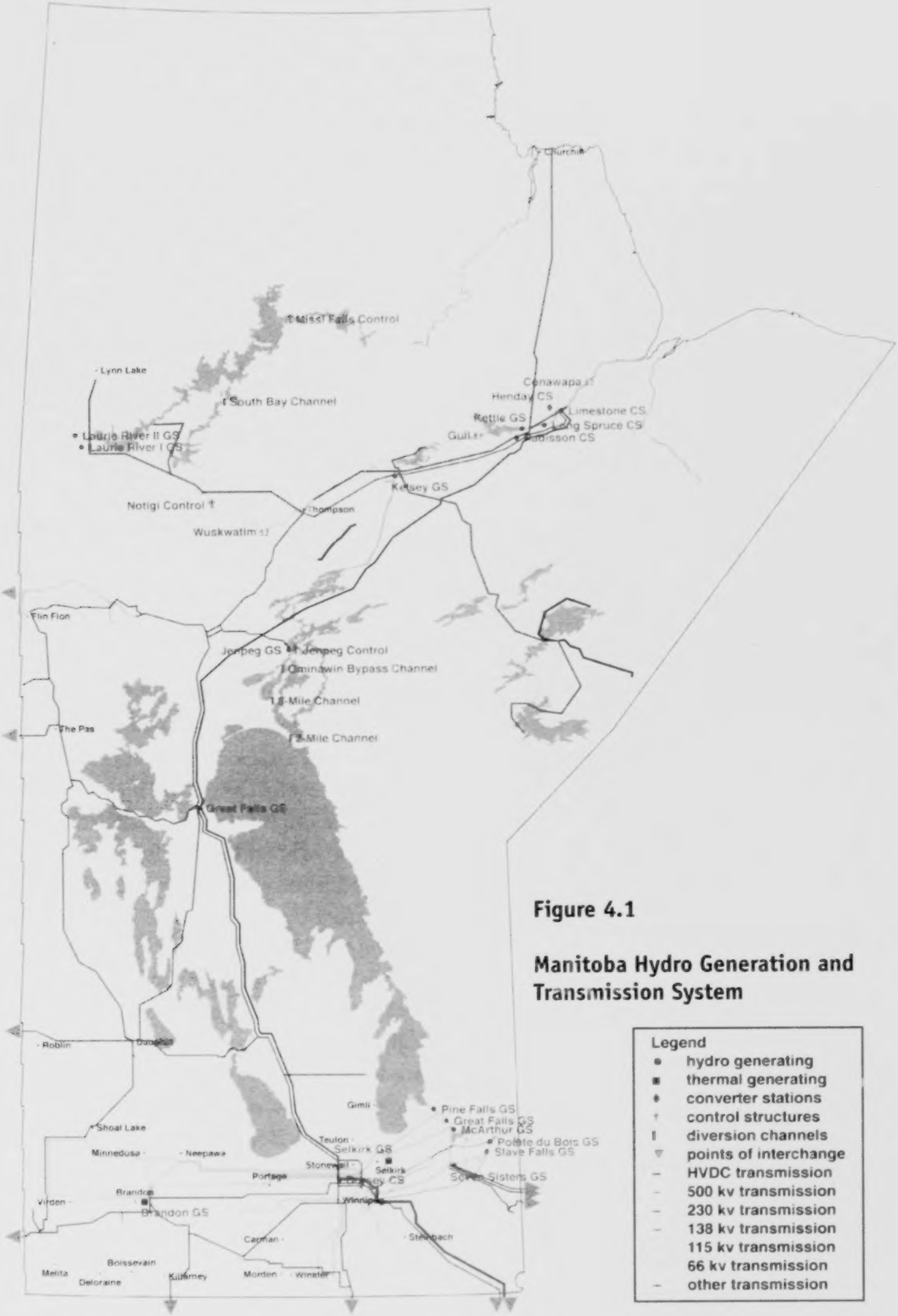


Figure 4.1

Manitoba Hydro Generation and Transmission System

and Environmental Management issued interim licences under *The Water Power Act* allowing MH to proceed with the LWR and the CRD. The interim licences issued in the 1970s have yet to be converted to final licences, an issue that will be addressed later in this report.

Since the decision to proceed with the CRD and LWR, the Long Spruce and Limestone generating stations have been constructed on the lower Nelson River. These plants, along with the Kettle station, which became operational in the early 1970s, produce over 70% of MH's average annual hydroelectric generation. A fourth plant at Jenpeg on the upper Nelson River provides electricity and controls the outflow from Lake Winnipeg. Other northern generating stations include Kelsey, located on the upper Nelson, Grand Rapids on the Saskatchewan River, and two small plants on the Laurie River.

4.2.2 Lake Winnipeg Regulation

The level of water in Lake Winnipeg is regulated to provide storage capability and increased flow to the downstream power plants in the winter, when MH has its peak energy requirements. Regulation is advantageous because the natural flow pattern from Lake Winnipeg into the Nelson River (that is, lower flow in winter than in summer) is opposite to the demand pattern for MH's electricity production. It is an integral part of the development of generation along the Nelson River and is integrated into the operation of the CRD and the lower Nelson River hydroelectric plants.

LWR infrastructure consists of three excavated channels that substantially increase the outflow capability from the lake, the Jenpeg control dam and generating station, which regulates the outflow, and a dam at the outlet of Kiskitto Lake to prevent water from backing up into that lake. On November 18, 1970, an interim licence was granted for the regulation of water levels on Lakes Winnipeg, Playgreen and Kiskittogisu in accordance with *The Water Power Act*. A supplementary interim licence was issued on August 8, 1972. The interim licences permit MH to regulate Lake Winnipeg for power production purposes when the lake level (with the effects of wind eliminated) is between 711.0 and 715.0 feet (ft) above sea level (asl). Above 715.0 ft asl, MH must operate the Jenpeg control structure to effect the maximum discharge possible under the circumstances then prevailing until the water level recedes to elevation 715.0 ft asl. When the lake level falls below 711.0 ft asl, MH is required to operate Jenpeg as ordered by the Minister responsible for *The Water Power Act*.

4.2.3 Churchill River Diversion

The CRD diverts a large portion of the flow of the Churchill River into the Nelson River via the Rat and Burntwood River system. A control dam at Missi Falls, the natural outlet of Southern Indian Lake, controls outflow from the lake down the Churchill River and raises the mean lake level by about 3-m above its long-term mean. A second control dam at Notigi Lake on the Rat River regulates the flow into the Burntwood River system and the lower Nelson River. An excavated channel from South Bay on Southern Indian Lake to Isset Lake on the Rat River system allows the Churchill River waters to flow into the Rat-Burntwood system and then into the Nelson River. (For details see Figure 4.2)

Construction of the diversion route commenced in 1973 and the CRD became fully operational in 1977, with flooding of areas around Southern Indian Lake and formation of the Notigi reservoir. The diversion is operated in accordance with the *Interim Licence For The Diversion Of Water From The Churchill River To The Nelson River, and The Impoundment Of Water On The Rat River And Southern Indian Lake*, dated December 19, 1972, and a second interim licence issued on May 11, 1973. Under the terms of this licence, water is stored in Southern Indian Lake to a maximum level of 847.0 ft asl and may be drawn down over winter to a minimum of 844.0 ft asl. Maximum allowable discharge through the Notigi structure is 30,000 cubic feet per second (cfs) and the flow at Thompson must not exceed the average mean flow of the pre-CRD Burntwood River plus the diverted 30,000 cfs. The licence also requires a minimum outflow from the control dam at Missi Falls down the Churchill River of not less than 500 cfs during the open-water season and 1,500 cfs during the ice-cover period. The City of Thompson Agreement stipulates that flows along the Burntwood River shall be regulated such that water levels are maintained at or below summer licence constraints of 188.66 m at the Thompson Seaplane Base and winter licence constraints of 189.88 m at the Thompson Pumphouse.

In 1998, as part of an agreement with the Town of Churchill, MH constructed a weir across the Churchill River near the town in accordance with licence 2327 under *The Environment Act*. Under the terms of this license, MH is required to maintain daily releases from Missi Falls no less than those that had been maintained historically for the period 1986 to 1998.

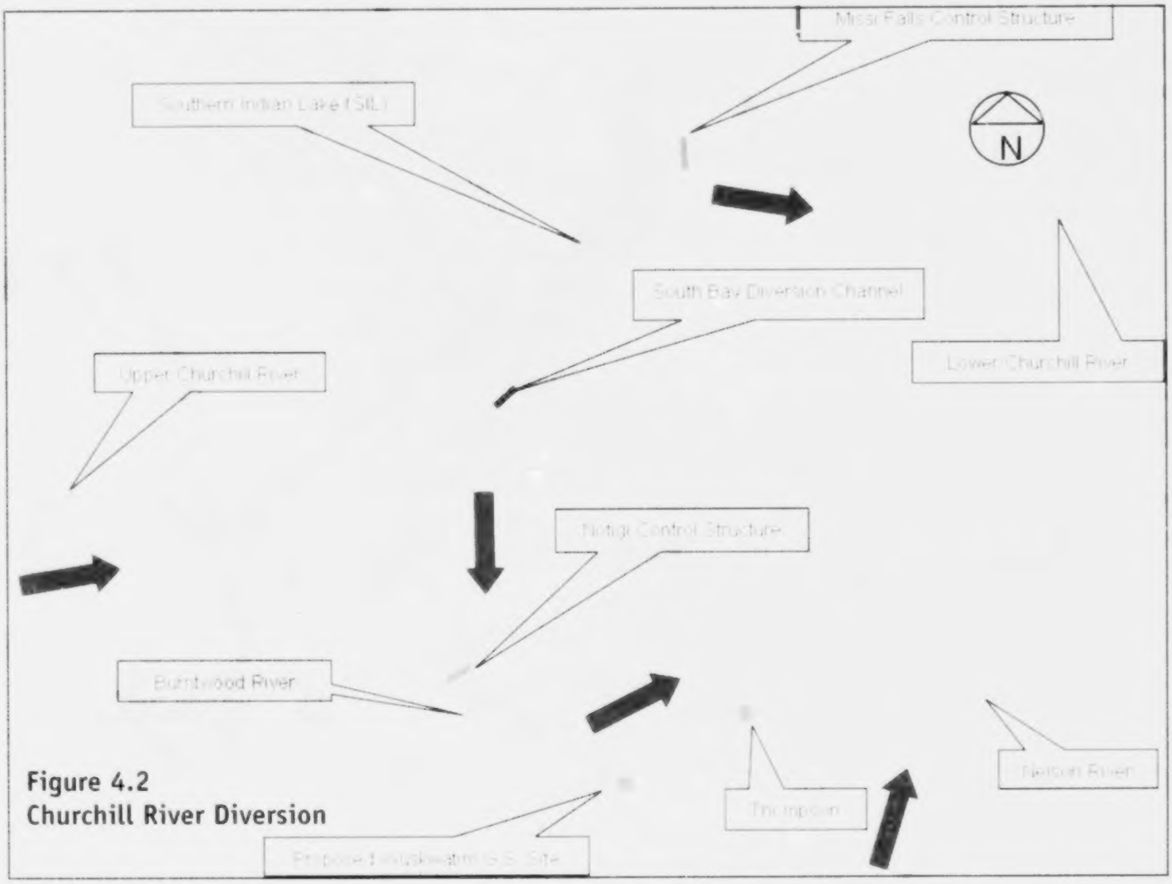

Missi Falls Control Structure
Southern Indian Lake (SIL)
N
South Bay Diversion Channel
Upper Churchill River
Lower Churchill River
Notigi Control Structure
Burntwood River
Nelson River
Thompson
Proposed Wuskwatim G.S. Site

Figure 4.2
Churchill River Diversion

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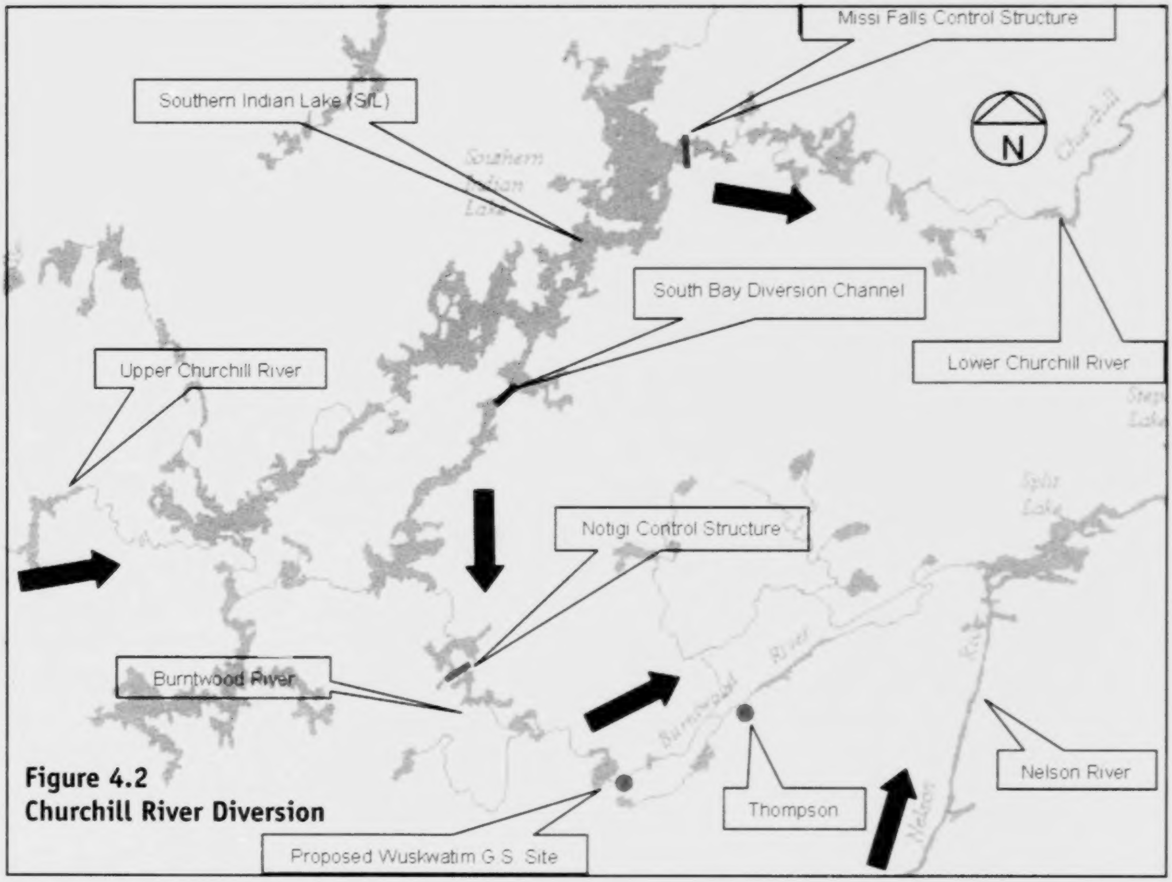

Figure 4.2
Churchill River Diversion

The additional flow down the Burntwood and lower Nelson Rivers as a result of the CRD adds a significant amount of dependable capacity to the generation plants along the lower Nelson as well as the proposed Generation Project. The diversion is of primary benefit to the system in winter, when ice restrictions limit the flow of water from Lake Winnipeg.

4.2.4 Augmented Flow Program

The Minister responsible for *The Water Power Act* approves an annual Augmented Flow Program (AFP) in response to requests from MH. The approval permits an expanded range of storage on Southern Indian Lake and changes the flow limits and levels downstream on the Burntwood River. Under the AFP, MH is allowed to increase the average weekly summer flow at the Notigi control structure from 30,000 to 35,000 cfs and the average weekly winter flow from 30,000 to 34,000 cfs. The maximum permitted level of Southern Indian Lake is increased by 0.5 ft to 847.5 ft asl and the minimum level is decreased to 843.0 ft. This increases the maximum allowable variation of the lake over a 12-month period from 3 to 4.5 ft.

The AFP allows increased diversion flows from the Churchill River and effective storage on Southern Indian Lake in order to increase and shape flows down the Burntwood River for hydroelectric production along the lower Nelson River. (Shaping is the term used to describe the scheduling of generating resources to meet seasonal and hourly load variations.) Under the AFP, MH is expected to fully mitigate any effects of the altered levels and flows, and the maximum draw down on Southern Indian Lake of 4.5 ft is to be staged over a period of time and in such a manner to minimize adverse impacts on South Indian Lake residents.

4.2.5 Northern Flood Agreement

The flooding and changes in water levels associated with these projects had serious long-term effect on local traditional Aboriginal communities and economies. In 1974, the five directly effected First Nations of Nelson House, Split Lake, York Landing, Cross Lake and Norway House formed the Northern Flood Committee (NFC) to facilitate joint discussions with MH and the two levels of government. The June 1975 final report of the Lake Winnipeg, Churchill and Nelson Rivers Study Board recommended certain mitigation measures. In 1977 the five NFC First Nations, the Government of Manitoba, the Manitoba Hydro-Electric Board and the Government of Canada signed the Northern Flood Agreement, which was intended to deal with adverse effects resulting and continuing to result from the modification of the water regime that accompanied the development of hydroelectric power in northern Manitoba. In the mid-1990s, Northern Flood Agreement Implementation Agreements were concluded between four of the NFA First Nations, MH, and the Governments of Canada and Manitoba to implement the 1977 NFA and to resolve most, although not all, outstanding claims stemming from the CRD.

4.3 Transmission System

MH's transmission system consists of 11,000 km of transmission lines operating at 115, 138, 230 and 500 kV alternating current (ac), and ±450 and ±500 kV direct current (dc). The transmission facilities are developed and operated as an integrated system with the province-wide network of high-voltage 230-

kV lines and stations being critical to overall system performance and reliability.

The backbone of the system consists of two 600-km HVdc transmission lines (Bipoles I and II) operating at a voltage of 450 and 500 kV, respectively. These two lines, located in a common corridor, transmit over 70% of MH's annual electricity production from the lower Nelson River to load centers in the south. Two converter stations at Radisson and Henday on the Nelson River convert electricity generated as alternating current to direct current. From these stations, electricity is transmitted via the dc system to the Dorsey station near Winnipeg, where it is converted back to ac. From the Dorsey station, the electricity is transmitted via the 230-kV transmission system to the distribution system within the province, as well as to Ontario, Saskatchewan and the U.S. A substantial amount of the electricity exported to the U.S. is transmitted over the 500-kV ac transmission line.

5. Wuskwatim Projects Description

5.1 Background

The proposed Projects consist of the development of a 200-MW generating station and associated infrastructure at Taskinigup Falls on the Burntwood River in the Nelson House Resource Management Area (RMA) along with the construction of the associated transmission facilities. While MH/NCN stated in the original filings that the in-service date for the Projects was expected to be 2009, this was revised to 2010 during the course of the hearings. The purpose of the Projects is to produce electricity for the MH system from capacity largely created by the CRD and AFP. While this electricity would initially be generated for export sale, MH estimates that the electricity will be required in 2019 to service domestic load.

5.2 Generation Project Description

5.2.1 Overview

Several alternatives were examined for the design of the Generation Project, each of which was considered feasible from a technical and economic perspective. The first and most significant decision was the selection of the upstream reservoir level. This level determines the amount of energy the plant can produce, as well as the degree of environmental impact due to flooding. A range of high- and medium-reservoir elevations was considered, including reservoir elevations up to 244 m asl. These high- and medium-reservoir elevations were rejected due to resulting extensive upstream flooding. In consultation with NCN, and, with the application of TSK, a low-head design with a forebay elevation of 234 m asl was selected. This elevation is near the upper range of water levels experienced on Wuskwatim Lake since construction of the CRD. The resulting head of water at the site would normally vary between 21 and 22 m. (The head of water is the difference between the upstream and downstream sides of the dam.)

The Generation Project would be capable of producing 200 MW of power. However, due to variations in outflows from the Notigi Control Structure, the station would not be able to produce 200 MW at all times. Over the course of a year, the generation station would be able to produce approximately 1,550 gigawatt hours (GW.h) of energy, operating at a capacity factor of over 85%.

Wuskwatim Lake is on the Burntwood River system, approximately 35 km south-east of Nelson House and 45 km south-west of Thompson. Wuskwatim Falls are at the lake's immediate southern outlet, and Taskinigup Falls are 1.5 km further downstream from Wuskwatim Falls. The proposed dam at Taskinigup would raise the water in the

Burntwood between Taskinigup Falls and Wuskwatim Falls from approximately 227 m to approximately 234 m asl, flooding approximately 37 hectares. The flooded area between Taskinigup Falls and Wuskwatim Falls would constitute the dam's immediate forebay, while Wuskwatim Lake would form the main forebay. The combined immediate and main forebays would constitute the entire reservoir.

5.2.2 Physical Description

The generation station portion of the Project includes the station itself, access road, construction camp and ancillary facilities such as water supply and treatment, and sewage treatment and disposal. The station's permanent facilities would include three fixed-blade turbine units located in a powerhouse complex, a spillway, and a main dam and dyke to develop the immediate forebay. Channel improvements would be made at the outlet from the lake to improve the outflow capability. (See Figure 5.1)

The generation station would normally be operated as a modified run-of-the-river plant on a daily average basis (that is, water entering Wuskwatim Lake daily would be discharged over a twenty-four hour period). This would result in some minor daily fluctuation of the lake level (generally up to 0.06 m) and upstream along the Burntwood River as far as Early Morning Rapids, approximately 27 km from the Generation Project. Early Morning Rapids would be the upper boundary of the direct effects on water levels from plant operation. Operation of the station would result in some minor water-level fluctuations along the Burntwood River as far as Birch Tree Lake, some 40 km downstream. At this point water-level fluctuations due to plant operations would no longer be discernible, given normal water-level fluctuations as a result of wind

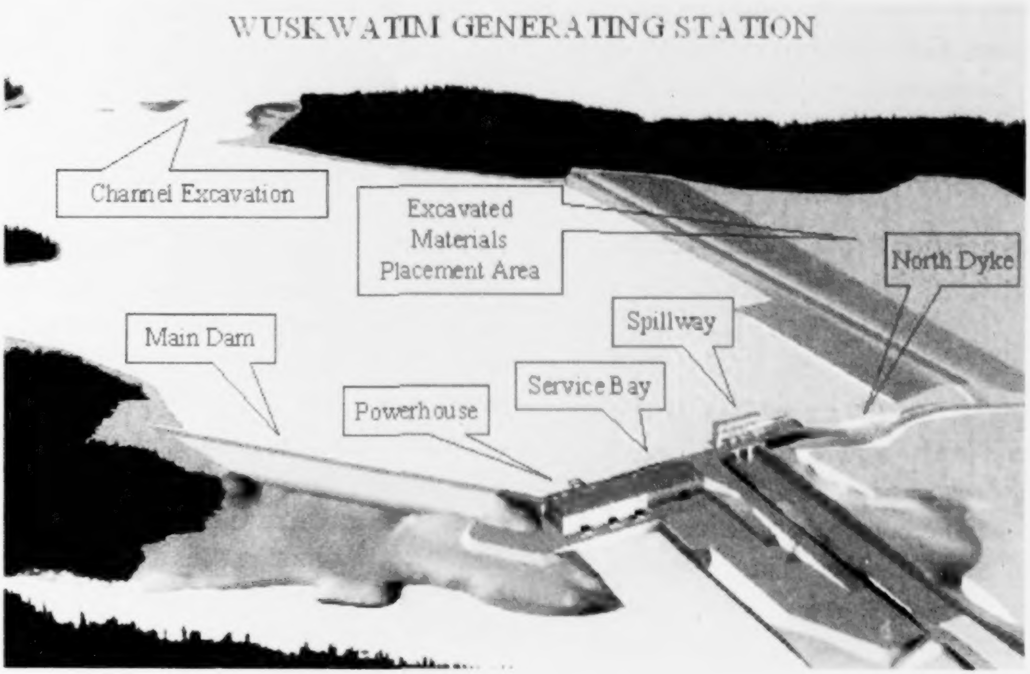

Figure 5.1

and waves. The water-level fluctuations resulting from the selected operating mode and choice of turbines are more fully described below in Section 5.2.4.

5.2.3 Project Construction

5.2.3.1 Access Road

Access to the Generation Project construction site would be provided by a 48-km gravel-surfaced all-weather road beginning at Mile 17 on Provincial Road 391. Mile 17 is located approximately one-third of the way from Thompson to Nelson House (Figure 5.2). The road would be designed and constructed to Manitoba Transportation and Government Services standards. It would require clearing of a 60- to 100-m wide right-of-way, stripping of organic material, placement of clay fill, and surfacing with granular material. Both the clay and granular materials would be taken from borrow pits along the access road route.

The access roadway would have two different designs. The northern portion, from PR 391 to the main granular borrow areas, would have a normal 9.7-m-wide surface. The southern portion would have a 13.4-m-wide surface to accommodate the increased truck haulage. Criteria used in the selection of the preferred access route included the beneficial and adverse effects on NCN, biophysical and socio-economic and cultural effects, project effects (including cost, technical considerations and construction time) and traditional knowledge.

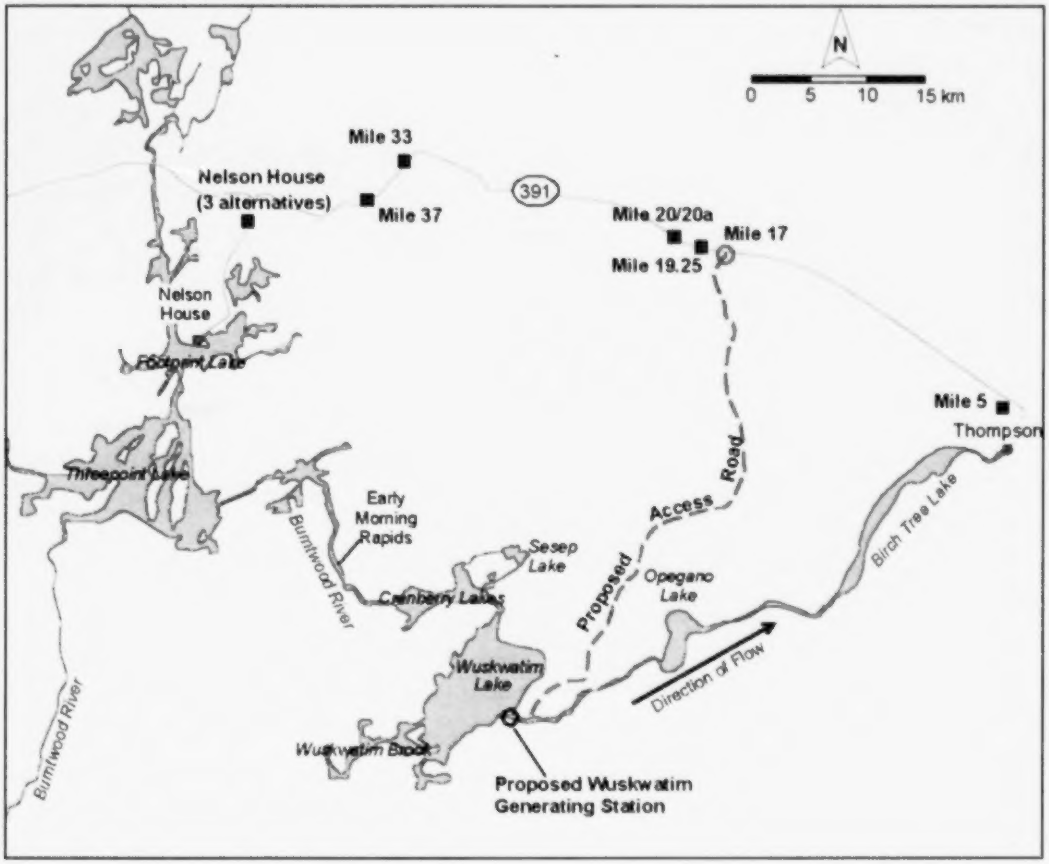

Figure.5.2 Proposed access road

Burntwood between Taskinigup Falls and Wuskwatim Falls from approximately 227 m to approximately 234 m asl, flooding approximately 37 hectares. The flooded area between Taskinigup Falls and Wuskwatim Falls would constitute the dam's immediate forebay, while Wuskwatim Lake would form the main forebay. The combined immediate and main forebays would constitute the entire reservoir.

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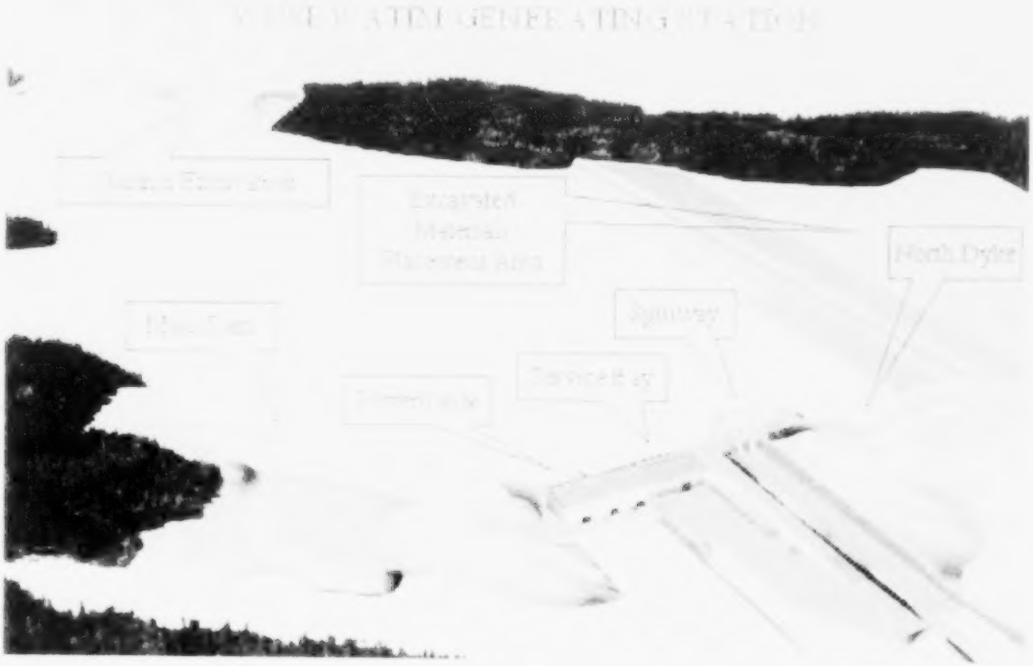
WUSKWATIM GENERATING STATION
Excavated Material Placement Area
North Dyke
Main Dam
Spillway
Service Bay
Powerhouse

Figure 5.1

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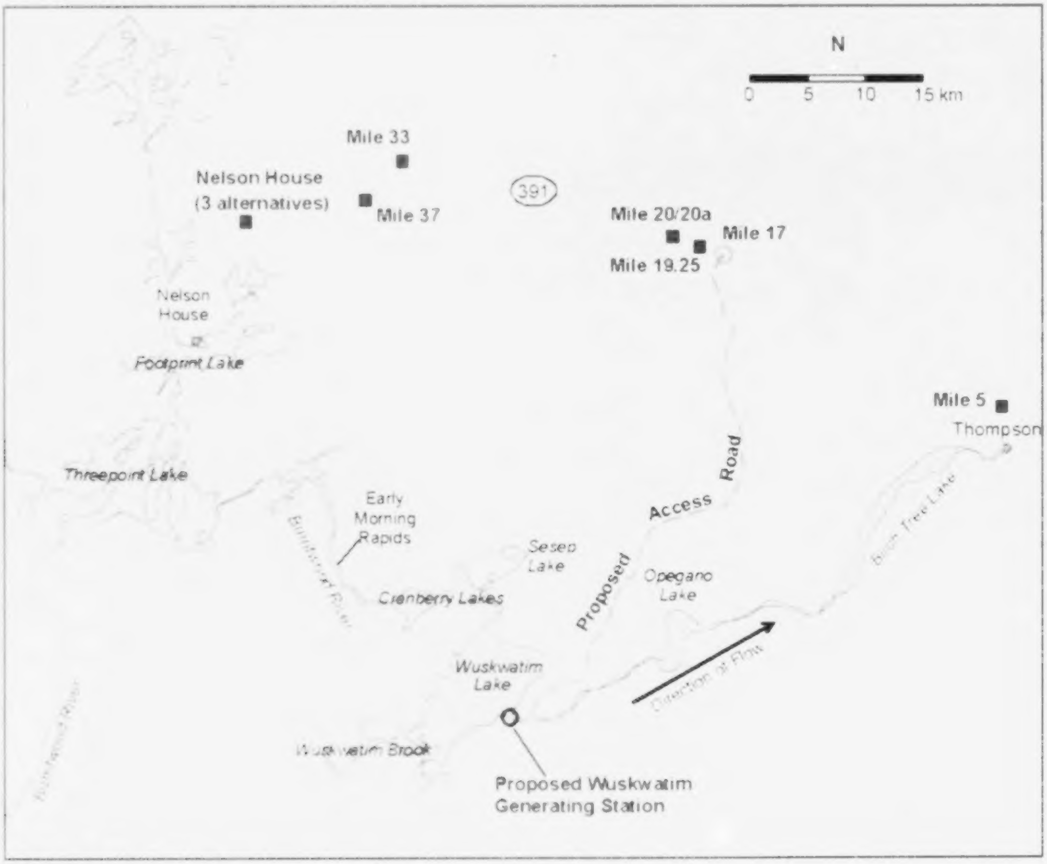

Figure.5.2 Proposed access road

TSK was used in the selection of the routing to avoid sensitive areas such as spiritual sites and caribou calving grounds.

A security gate at the junction of PR 391 would be staffed full-time during the construction period. The road would remain in place after construction for servicing and maintaining the station during the operational phase. A long-term access management plan would be developed and put in place prior to this period.

5.2.3.2 Construction Camp and Facilities

The Generation Project would require a construction camp and associated infrastructure, contractor's work area, MH work area and on-site access area. MH employed the same selection criteria to evaluate construction camp options as used for locating the access road. The options included a full camp at the generating station site and a split camp – with a main camp at the generating station and with sleeping accommodations and second kitchen near either Nelson House or the junction of PR 391 and PR 280. The preferred option is a full construction camp at the site. This avoids the costs of duplicating facilities in two locations and the potential adverse social effects associated with having a construction camp near a community. It also avoids the effect on workers of a long daily commute to and from the work site. The camp would include a full-service 625-person mobile trailer camp with water-treatment and sewage lagoon. It would also include a recreation/training building, a gymnasium, a helicopter landing pad and recreation fields. The water-supply and treatment system, as well as the sewage collection, treatment and disposal systems, would be designed and operated in accordance with provincial requirements.

The amount of land required for the construction, operation and maintenance of the Generation Project, excluding the land required for the permanent transmission line and associated facilities is 147 ha with an approximate area of site disturbance of 487 ha. Site clearing would involve clearing and grubbing (removal of roots) only where essential. This would include the areas occupied by the generation station, site infrastructure and access roads. Clearing, grubbing and disposal of non-merchantable timber would be undertaken in compliance with government guidelines. Merchantable wood would be salvaged where economically feasible. The construction camp would be disassembled and the site restored upon completion of the Project.

5.2.3.3 Construction Material Sources

The construction of the Generation Project would require the use of naturally occurring materials such as sand for granular fill and silty clay for impervious fill. Manufactured and crushed rock material would be required for rock fill, riprap (large rocks or boulders placed along a shoreline to protect against erosion) and concrete aggregate. These materials would be derived from on-site excavations. A temporary local rock quarry may also be required. The required excavation of the overburden and rock for the powerhouse and spillway structures would likely provide all the impervious fill and rock requirements for the generation station. The only material not available on-site is sand. A number of locations along the access road have been identified as sources for this material.

5.2.3.4 Schedule

Assuming regulatory approvals prior to the end of 2004, work on the Generation Project would commence in 2005 with construction of the access road, clearing of the construction site, erection of the construction power line, and initiation of the construction camp. In 2006, work would commence on the general contractor's work area and the stage 1 cofferdam would be constructed. (A cofferdam is a temporary dam constructed to divert water to allow for work in a river or lake under dry conditions.)

Work on placing concrete for the powerhouse and spillway would commence in 2007 and continue over a three-year period. The powerhouse would be enclosed in 2008 to allow the eventual installation of turbines and generators in 2010. The forebay would be cleared, the spillway channel would be opened, the stage 2 cofferdam would be constructed, and work on the main dam would commence in 2009. With completion of the powerhouse in 2010, the first turbine would be commissioned in May and the last turbine would be commissioned in September. Camp decommissioning and site rehabilitation would likely extend into 2011.

5.2.3.5 Workforce

The projected annual construction workforce for the Generation Project would range from 145 to 540 workers. These numbers do not include the contractor's supervisory staff, MH staff, camp operation staff and transmission-line construction workers.

5.2.3.6 Waste Disposal

Construction of a two-cell sewage lagoon to treat wastewater generated by the construction camp for a 625-person capacity would be discharged twice a year into the Burntwood River. All hazardous and non-hazardous waste would be collected, transported and disposed of in accordance with provincial and federal requirements. Scrap wood and paper products would be burnt in a permitted designated area at the site. Other waste would be disposed of either in a permanent waste disposal facility developed on site or transferred to an existing waste disposal site in Thompson. Any on-site waste storage would be managed in a manner that prevented access by wildlife.

5.2.4 Project Operation

The Generation Project would consist primarily of a three-unit intake/powerhouse/service bay complex, a three-bay spillway, and a main embankment dam and dyke to contain the immediate forebay. The purpose of the main dam and associated structures is to direct the river flow into the powerhouse through the intakes into the scroll case (a large circular intake from the face of the dam), past control mechanisms called wicket gates, onto the propeller turbines. Each turbine is connected to a vertical shaft that rotates a generator that produces electricity.

The amount of electricity produced is determined by the wicket-gate setting, which regulates the flow through the unit. These gates are controlled by a series of controls and monitoring systems located in the Generation Station control room. The plant can be operated on-site or remotely.

5.2.4.1 Generation Station

The Wuskwatim generation station would operate in a modified run-of-the-river mode about 97.5% of the time (normal operation). A run-of-the-river plant is one where the outflow equals the inflow on a continuous basis. The modified run-of-the-river plant proposed by MH would use the turbines to balance or shape the outflows to match inflows on a daily basis. This mode of operation is made possible by the AFP, which stabilizes and shapes flows into Wuskwatim

Lake. Generally, the turbines would be operated at their most efficient or "best-gate" setting. The plant is designed with three fixed-blade turbines with a maximum flow capacity of 1,100 cubic metres per second (m^3/s). This would result in 1, 2, or 3 turbines operating at "best gate" of 330 m^3/s for one turbine, 660 m^3/s for two turbines and 990 m^3/s for three turbines. While operation would vary between one, two and three turbines, changes in operation from one to three or three to one turbines would not occur (that is, the change in the number of turbines operating on any one day would not vary by more than one under normal operating conditions). For inflows greater than 990 m^3/s and less than 1,100 m^3/s, plant outflow can be modified by operating between best-gate and full-gate outflow or by passing the flow unmodified. When inflows are greater than 1,100 m^3/s excess flows would be released through the spillway structure.

Maximum fluctuations in tailwater levels of 1.29 m (open water) and 1.47 m (winter ice cover) would occur when operating at on-peak flow of 660 m^3/s (two units) and off-peak flow of 330 m^3/s (one unit). (Tailwater refers to the water surface immediately downstream from a dam or hydroelectric powerplant.) This operation would result in maximum daily water-level fluctuations at Opegano Lake, 13-km downstream of the plant, of approximately 0.42 m in open water and 0.43 m in winter. The water level of Birch Tree Lake, some 40-km downstream of the generation station, would have a maximum daily fluctuation 0.07 m and 0.13 m for open water and winter operation, respectively. These fluctuations are within the approved terms and conditions for Birch Tree Lake.

Under emergency operations resulting from a combination of low-flow conditions (about 3% of the time) and coincident failure of MH's HVdc transmission system, plant operation could change from one unit operating at best gate to three units operating at full gate, with a resultant tailwater increase of 2.75 m. This operation would likely be of short duration (i.e. 10 minutes to 1 hour) and would be largely dampened out by Opegano Lake. The daily fluctuations in water levels in Opegano Lake and downstream due to operation of the generation station would be small relative to the weekly or monthly variation in water levels now occurring as a result of the operation of CRD.

Upstream, water levels would be raised near the end of the construction period to the design level of 234 m. This would result in a 7-m increase in water levels in the immediate-forebay level between Taskinigup Falls and Wuskwatim Lake, resulting in the flooding of 37 ha. The Generation Project has been designed so that the forebay water levels will range between 233 and 234 m asl. Water levels on Wuskwatim Lake would be maintained at about 234 m, which is approximately 0.4 m above the long-term average lake level post CRD. Under normal operation (that is 97.5% of the time), Wuskwatim Lake levels would remain within the top 25 cm of the specified operation range, with average daily fluctuations of 0.06 m and maximum daily changes of 0.08 m in the lake level and 0.13 m in the immediate forebay. (See Figure 5.3)

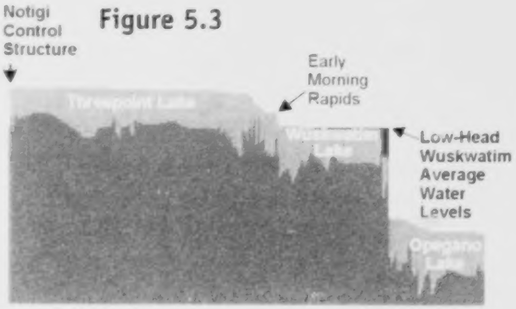
Figure 5.3

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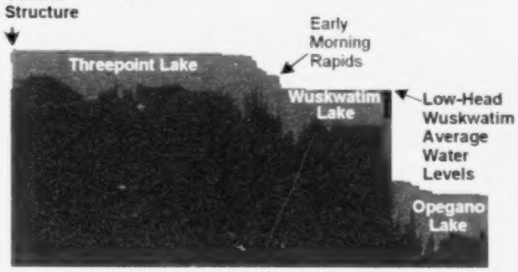
Figure 5.3



Up to 1 m of storage within the forebay (233.0 m to 234.0 m) has been designed for utilization under abnormal conditions. These conditions may occur when power requirements are high and when inflows are very low. Under these conditions, which are expected to occur once in twenty years, the lake could be drawn down to a range of 233.25 to 233.0 m for a period of 4 to 7 weeks. It would likely take the same period of time to return to normal levels.

The seasonal distribution of Wuskwatim energy production is directly related to CRD flows, which are managed in order to optimize the output of the large downstream stations along the lower Nelson River. The timing of the daily and seasonal energy production from the Generation Project may not be consistent with when it is most valuable to the overall system including export sales. During these times, power production could be reduced at plants along the Nelson and water saved for use in order to produce power in a more optimal pattern. This would have a small effect on the operation of other components of the Manitoba Hydro system in order to modify the system output (termed reshaping) as explained below.

5.2.4.2 Southern Indian Lake

Upstream water-level fluctuations have been determined by MH to extend as far as Early Morning Rapids, beyond which MH predicts that there would be no change in water levels as a result of the operation of the generation station. MH has also stated that there would be no change in the operation of the CRD as a result of the construction of the generation station. Accordingly, the Project would not have any effect on Southern Indian Lake.

5.2.4.3 Lake Winnipeg Regulation

MH/NCN have indicated that if power from the Generation Project is required in exactly the same hourly pattern in which it is produced, there would be no requirement to reshape the system output and the operation of LWR would not change. If power from the Project is required in a different pattern over a day or a week, reshaping would take place at the generation stations on the lower Nelson River, just as is currently done. In this instance as well, LWR operation would not change. In the event that power produced from the Generation Project could be more optimally utilized in a different season, then the operation of LWR would be modified in order to reshape the system output, as the purpose of LWR is to store water in order to match the supply to the maximum energy requirements in winter. The degree of modification of operation of LWR would be very small, as the amount of reshaping required would be very small compared to the reshaping already being carried out by means of LWR for the 3,500 MW of generation on the Lower Nelson.

As an example, MH/NCN stated that if 50% of the energy production at Wuskwatim in a winter month could be more efficiently utilized by the system in a summer month, the flow at Jenpeg in the summer month would be increased by 3%.

These relatively small changes in the operation of LWR could have a small affect on the level of Cross Lake which is immediately downstream of the Jenpeg Control Structure.

5.2.4.4 Cross Lake

Cross Lake is situated immediately downstream from the Jenpeg Generation Station about 100 km south of Wuskwatim Lake.

Based on the assumption of a firm power-sale agreement being negotiated by MH, such that the firm annual energy from the Projects is sold as a firm export sale evenly distributed over the year and the remaining non-firm annual energy is sold as non-firm export sales, MH/NCN have stated that the summer elevation of Cross Lake, is expected to decrease by an average of 0.04 ft, with a maximum decrease of 0.12 ft (~1.5 in). The average winter elevation is expected to increase by 0.05 ft with a maximum increase of 0.14 ft (~1.7 in). The reason for the slightly lower summer and slightly higher winter elevations is that the uniform distribution of the export sale requires a transfer of water from summer to winter to meet the firm sale obligation.

Where a firm contract is not negotiated, all energy from the Generation Project would be sold by way of non-firm export sales, resulting in an average summer elevation increase of Cross Lake of 0.13 ft with a maximum increase of 0.36 ft (~ 4.3 in). The average winter elevation is expected to decrease by 0.10 ft, with a maximum decrease of 0.26 ft (~ 3.1 in). In the case of the use of the Project's power to serve domestic loads, the impact on Cross Lake would be similar to the firm export-sale scenario.

5.2.4.5 Permanent Facility

MH would be required to operate the Generation Project in conformance with the terms and conditions of *The Water Power Act* interim licence to be issued by Manitoba and any other regulatory approvals. The station would be operated remotely through state-of-the-art electronic control systems linked to telecommunication facilities. A workforce of three to four technicians and two utility workers would be required. A range of operation and maintenance activities are proposed to ensure the safe and efficient operation of the station.

Access to the generation site would be restricted and controlled through the use of various measures, including secure fencing, signage and monitoring systems. MH/NCN have indicated that an access management plan would be in place. Potentially hazardous areas at the station site would be marked with signs. Signs would also be posted along the shoreline where potentially dangerous conditions exist. An emergency preparedness plan for the generation station would deal with major emergency scenarios.

5.2.5 Decommissioning

The plant has been designed for a 100-year life. Should MH and/or the proposed Wuskwatim Power Partnership conclude that the station is no longer required, MH is legally obligated to develop a decommissioning plan. This plan would then be jointly submitted for regulatory review and approval prior to execution.

5.2.6 Commission Comments and Observations – Generation Project

The Commission notes that MH/NCN have jointly selected a low-head design that would result in a forebay elevation that is within the present range of water levels on Wuskwatim Lake and would limit flooding to the immediate forebay. The Commission also notes that MH/NCN have selected a modified run-of-the-river operating mode that would limit upstream and downstream water-level fluctuations. These design and operational decisions have been made taking TSK into account.

The Commission is of the opinion that the Generation Project design advanced by

MH/NCN is adequately detailed to permit the development of sufficiently accurate project cost estimates and power production figures such that acceptable economic analyses can be developed by MH/NCN for review by the Commission and all Participants. The Commission also believes that the project operation and resulting water-level fluctuations are sufficiently described to permit a reasonable determination of potential environmental effects.

5.3 Transmission Project

5.3.1 Overview

Development of the Generation Project requires the construction of new transmission lines and stations to transmit the electricity generated into the existing MH system. The three fundamental considerations in developing a transmission concept for the Project were the provision of the necessary capacity to deliver the additional 200 MW of power to the existing transmission network, provision of back-up capacity to ensure continuity of transmission in the event of outage or failure, and adjustment of the concept to reflect system operation and reliability considerations. These criteria reflect industry-wide standards, the relationship between export prices and sales contracts and the ability to deliver electricity on a firm basis. In the case of the Transmission Project, the concept has also been influenced by the requirement for construction power at the site and by the availability of network connections at various transmission stations within the general region. (See Figures 5.4 and 5.5)

5.3.2 Physical Description

The Transmission Project involves:

- Three lines, each less than 1-km long, to connect the Wuskwatim generation station to the proposed Wuskwatim Switching Station.
- A 230-kV 45-km transmission line to connect the Wuskwatim Switching Station to the proposed Birchtree Station at Thompson. This line would be used initially to provide power to a temporary construction sub-station for development of the proposed generation station.
- Two 230-kV transmission lines, each approximately 137-km long, to connect the Wuskwatim Switching Station and the existing Herblet Lake Station, north of Snow Lake.
- Advancement of construction of a 230 kV 165-km transmission line from the Herblet Lake station to the existing Rall's Island Station near The Pas from its current schedule. This line would eventually be required to strengthen the existing system without the Project.

A 60-m right-of-way width would be required for the single transmission line proposed between the Wuskwatim Switching Station and the Birchtree Station, and between the Herblet Lake and Rall's Island stations. The two parallel lines proposed between the Wuskwatim Switching Station and Herblet Lake Station would require a 110-m wide right-of-way.

The proposed 230-kV lines would, for the most part, traverse Government of Manitoba Crown land. Exceptions would occur on the approaches to the Birchtree, Herblet Lake and Rall's Island stations, where the lines would cross land subject to local government jurisdiction.

5.3.3 Project Construction

5.3.3.1 Design

Based on prior design and construction experience in northern Manitoba, a guyed lattice steel structure has been chosen as the standard design for tangent sections of the transmission lines. This guyed structure provides flexibility, allowing periodic guy anchor adjustments in soil conditions where shifting of structure foundations may occur. Where rock is present, self-supporting lattice steel structures would be used at angle locations, and where soil conditions are poor, guyed lattice steel structures would be used at angle locations. Final structure locations would be fixed on the basis of field surveys following environmental licensing of the project.

The structure foundations proposed for the Transmission Project would be similar to those employed on other MH northern projects and would include foundations designed specifically for rock, stable soil, unstable soil, and permafrost conditions.

5.3.3.2 Contracting

Contractors would carry out transmission-line construction during winter to facilitate access and to minimize risk of adverse environmental impact. Clearing and construction of each section of the transmission lines would generally require two

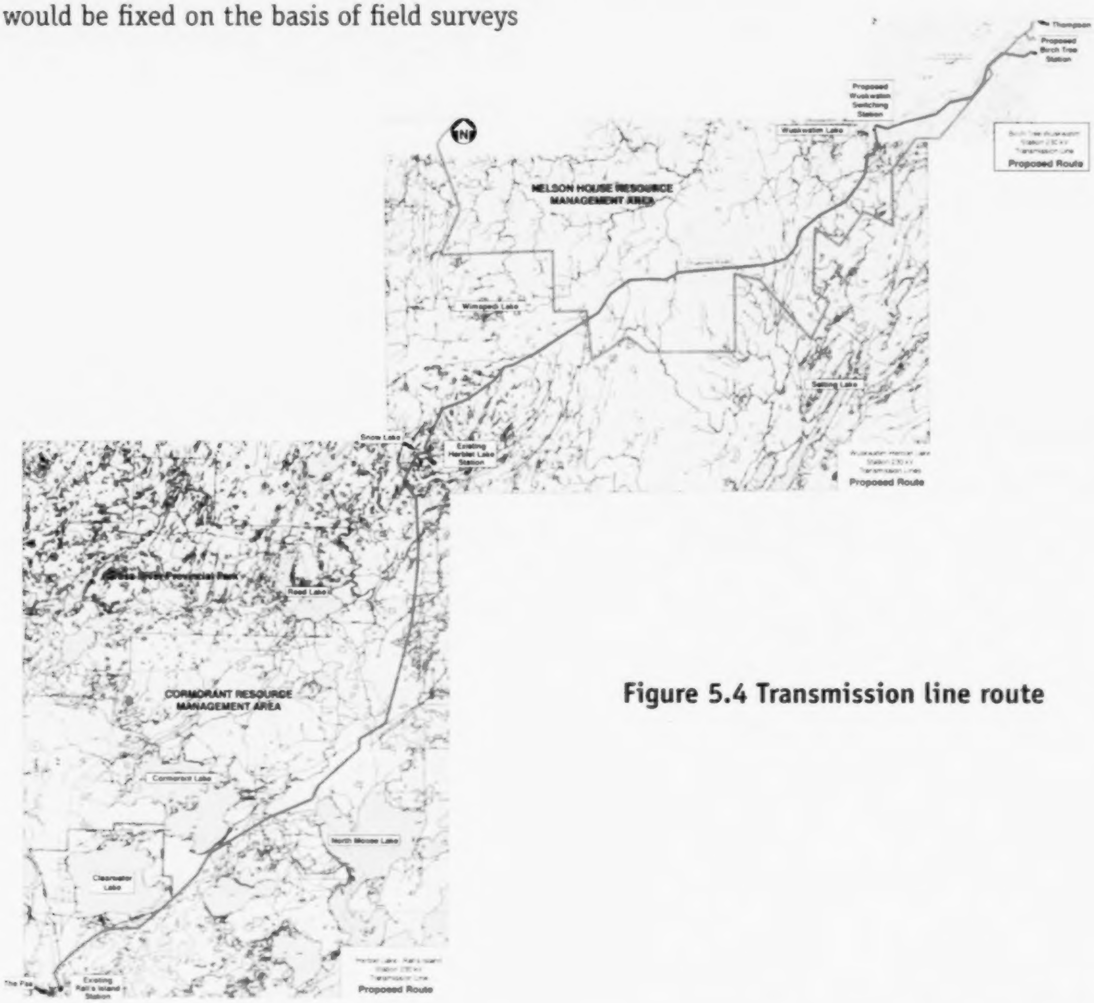

N
Thompson
Proposed Birch Tree Station
Proposed Wuskwatim Switching Station
Wuskwatim Lake
Proposed Route
NELSON HOUSE RESOURCE MANAGEMENT AREA
Wimapedi Lake
Setting Lake
Snow Lake
Existing Herblet Lake Station
Proposed Route
Reed Lake
CORMORANT RESOURCE MANAGEMENT AREA
Cormorant Lake
North Moose Lake
Clearwater Lake
The Pas
Existing Ralls Island Station
Proposed Route

Figure 5.4 Transmission line route

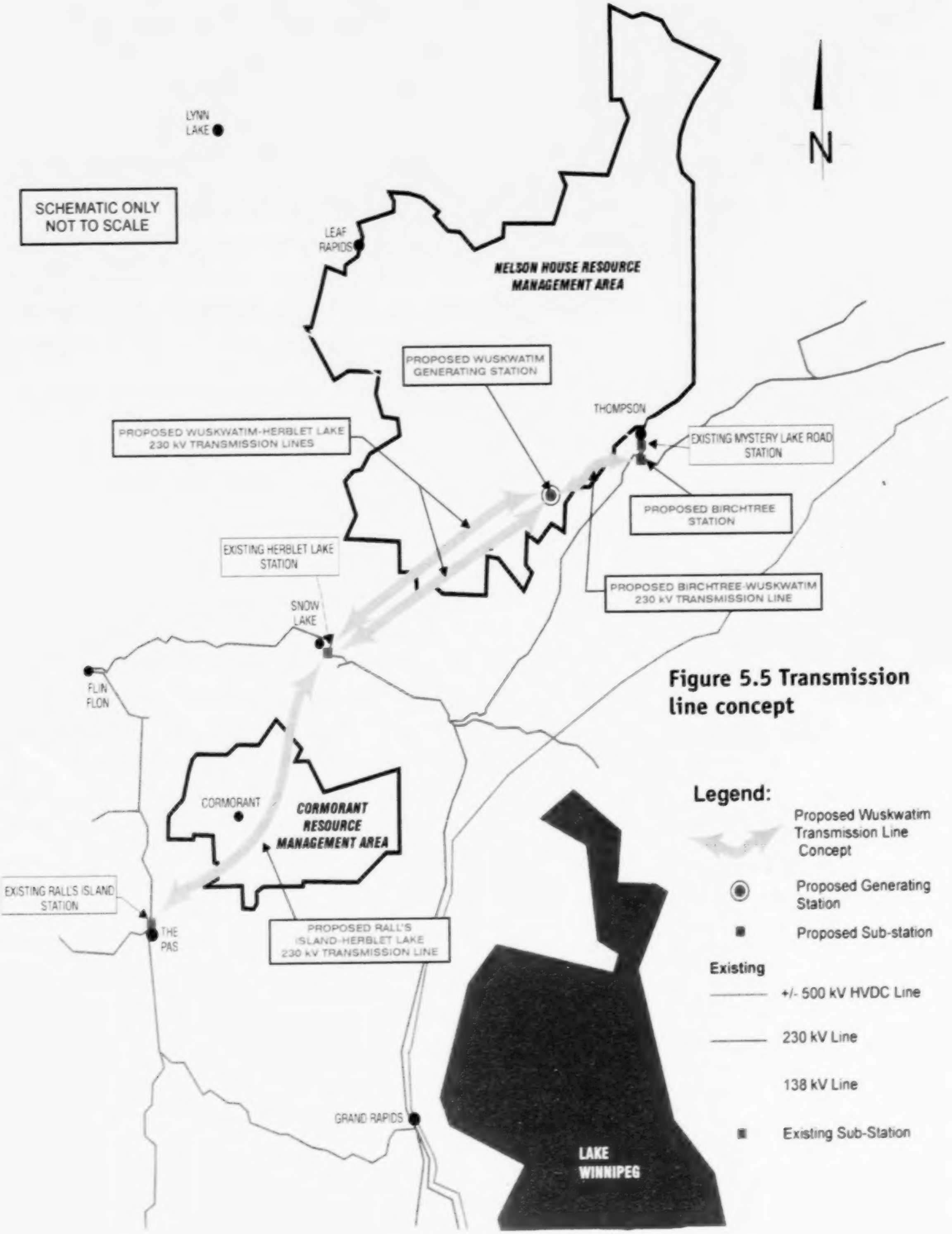

LYNN LAKE
SCHEMATIC ONLY NOT TO SCALE
N
LEAF RAPIDS
NELSON HOUSE RESOURCE MANAGEMENT AREA
PROPOSED WUSKWATIM GENERATING STATION
THOMPSON
PROPOSED WUSKWATIM-HERBLET LAKE 230 kV TRANSMISSION LINES
EXISTING MYSTERY LAKE ROAD STATION
PROPOSED BIRCHTREE STATION
EXISTING HERBLET LAKE STATION
PROPOSED BIRCHTREE-WUSKWATIM 230 kV TRANSMISSION LINE
SNOW LAKE
FLIN FLON
CORMORANT
CORMORANT RESOURCE MANAGEMENT AREA
EXISTING RALL'S ISLAND STATION
THE PAS
PROPOSED RALL'S ISLAND-HERBLET LAKE 230 kV TRANSMISSION LINE
GRAND RAPIDS
LAKE WINNIPEG
Legend:
Proposed Wuskwatim Transmission Line Concept
Proposed Generating Station
Proposed Sub-station
Existing
+/- 500 kV HVDC Line
230 kV Line
138 kV Line
Existing Sub-Station

Figure 5.5 Transmission line concept

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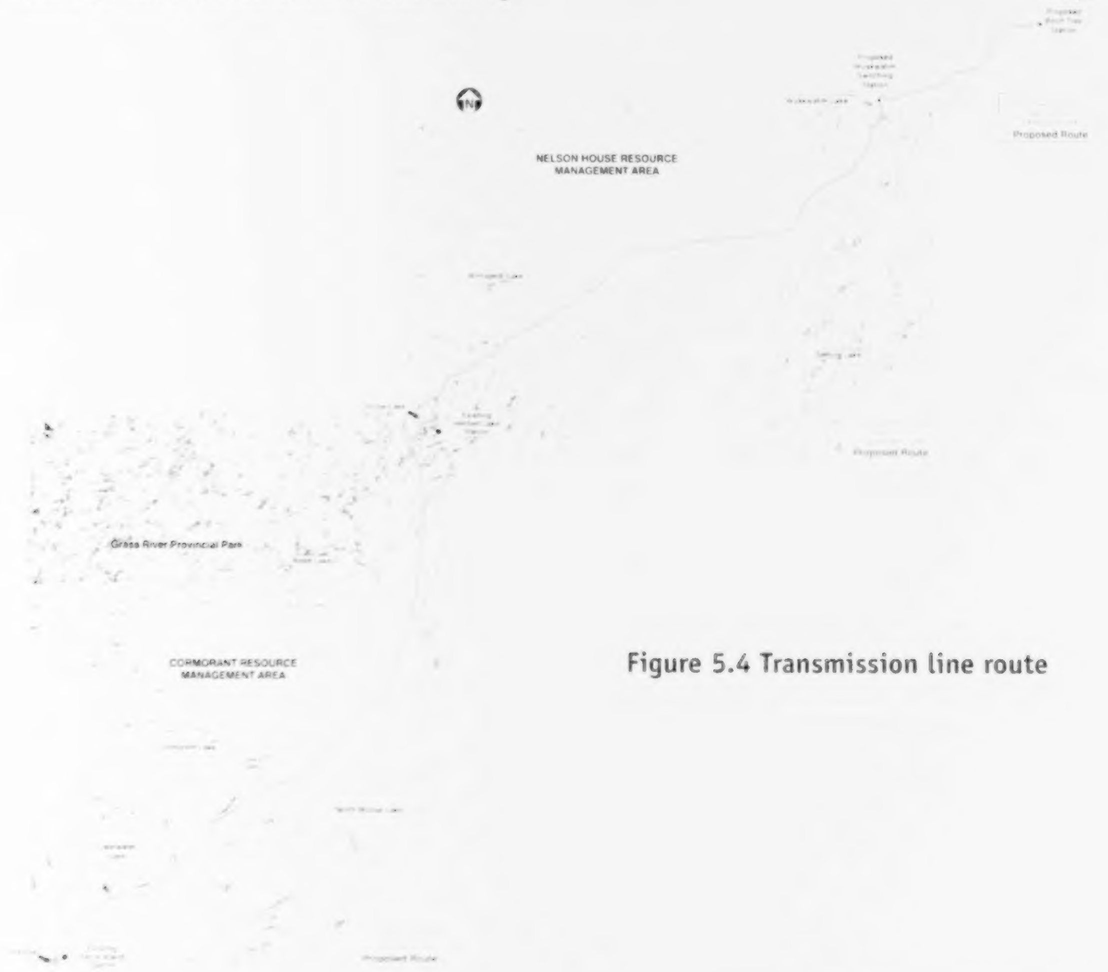
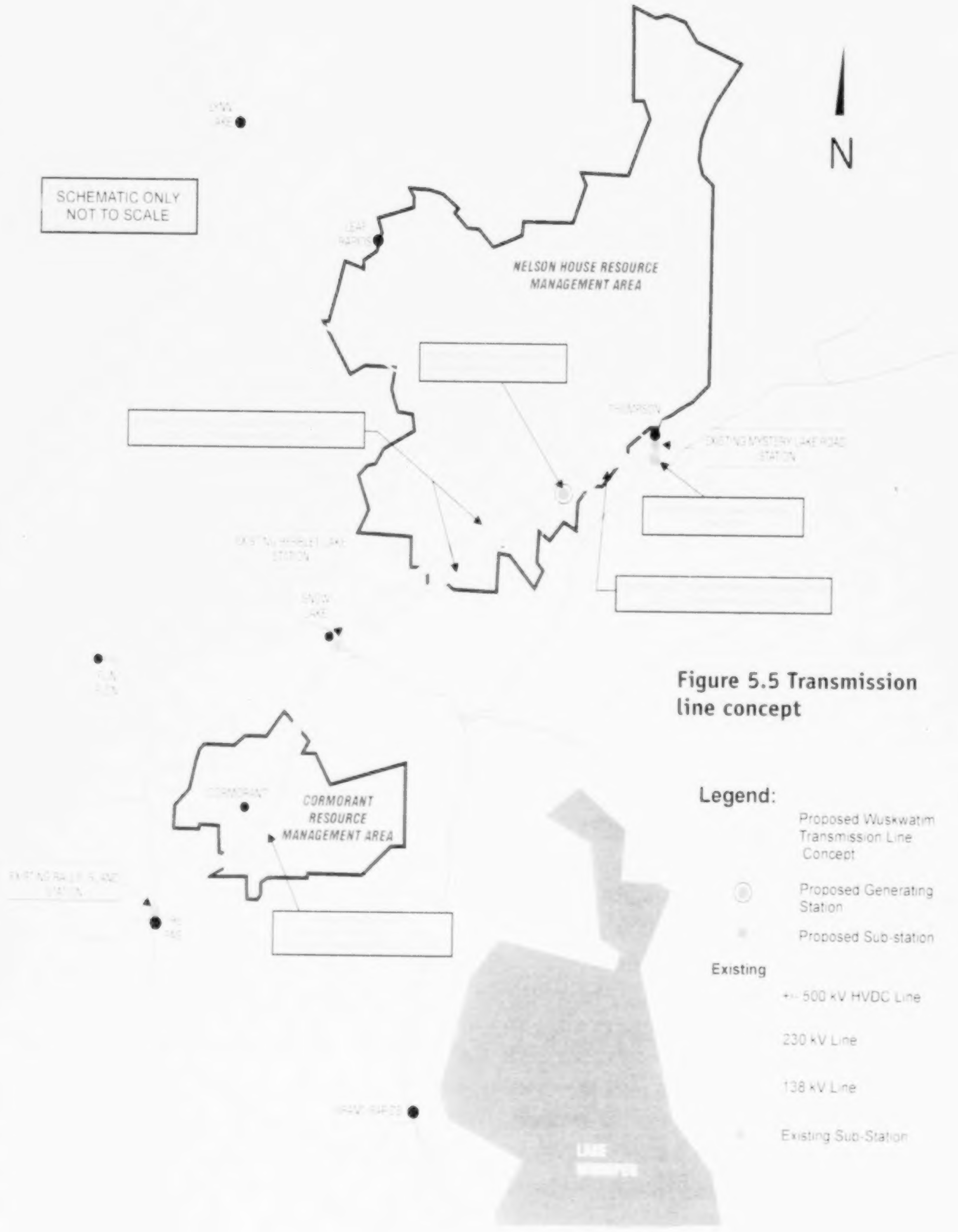

Proposed Route
NELSON HOUSE RESOURCE MANAGEMENT AREA
Grass River Provincial Park
CORMORANT RESOURCE MANAGEMENT AREA

Figure 5.4 Transmission line route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EXISTING HERBLET LAKE STATION
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FLIN FLON
CORMORANT
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THE PAS
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Proposed Sub-station
Existing
+/- 500 kV HVDC Line
230 kV Line
138 kV Line
Existing Sub-Station

Figure 5.5 Transmission line concept

years. This phase of the overall Transmission Project is scheduled to take place over six years.

5.3.3.3 Construction Camps

Depending on the location of construction, clearing and construction workers may be housed in mobile camps located in well-drained areas within the right-of-way. Some additional clearing may be required at these sites in order to accommodate material storage, vehicular traffic, and maintenance shops.

5.3.3.4 Stations

Property requirements for transmission stations are dependent on the nature and final layout of the stations. MH typically purchases land for the station sites. Wherever possible, construction workers would be housed in nearby communities and transported to and from the work site. Stations required for the Transmission Project include a 230-kV gas-insulated switching station to be constructed at the Generation Project site, and a new switching station (Birchtree Station) to be situated in the Local Government District of Mystery Lake, just south of the City of Thompson. Equipment additions at the existing Herblet and Rall's Island stations would be required to terminate the new lines.

5.3.4 Project Operation

The Transmission Project would be operated as an integral part of MH's overall integrated transmission system.

5.3.5 Decommissioning

No decommissioning plan specific to the transmission system was provided by MH/NCN in the EIS.

5.3.6 Commission Comments and Observations – Transmission Project

The Commission actively questioned MH/NCN about alternative routing and the relative costs of construction along existing rights-of-way rather than relatively undisturbed boreal forest.

The Commission accepts MH/NCN's position that there is generally no cost saving to be achieved by following existing rights-of-way and that the highway option examined by MH/NCN resulted in an additional 176 km of transmission lines at a cost of $35.6-million

The Commission notes that the route selected by MH/NCN generally follows the most direct route between switching stations and that portions of the lines have been routed through the NCN RMA in order to assist in controlling access. The Commission is also of the opinion that the transmission line design and routing is sufficiently defined such that a reasonable assessment of the likely environmental effects can be made.

The Commission expected that given the service life of transmission lines of 50 years and 35 years for transmission stations, that MH/NCN should have developed and presented a decommissioning plan. Accordingly, the Commission will be recommending that *The Environment Act* licence for the Transmission Project require the preparation of a decommissioning plan that addresses technical and environmental considerations.

6. Justification: Need For and Alternatives To

6.1 Introduction

6.1.1 Need For and Alternatives to the Projects

The Government of Manitoba requested the Commission to review the Need For and Alternatives To (NFAAT) MH's proposal to construct and develop the Projects. MH/NCN submitted the NFAAT filing in April 2003 and an opportunity was provided for public participation and discussion prior to MH and NCN proceeding with the Projects.

Based on its consideration of the Need For and Alternatives To issues that are described in this chapter, the Commission has concluded that the projects represent an economic alternative and an in service date of 2010 should be pursued. The full licensing recommendation comes in the following chapter of this report, which examines the Environmental Impact Statements (EIS). The Commission wishes to emphasize that its recommendation to proceed with the Projects is based upon MH's commitment to also maximize the benefits of both demand-side management (DSM) and supply-side enhancement initiatives (SSE) (which are discussed below) as well as the Projects.

This chapter of the report sets out the information the Commission considered, its comments, and its recommendations and is organized under the following headings:

- Introduction
- Business Structure
- Project Costs
- Export Market
- Economic and Risk Evaluation
- Financial Analysis
- Resource Options
- Summary Conclusions

6.1.2 Definitions of Justification, Need For and Alternatives To

Throughout the hearings, the Commission was presented with definitions of what is meant by "justification" of a project, "needs for" a project, and "alternatives to" a project. MH/NCN stated that justification required the overall consideration of the need for the Projects and the alternatives to the Projects.

The CEAA defines "need for" as the problem or opportunity the project is intended to solve or satisfy. MH/NCN took the position that market demand for electricity (including export-market demand) was one form of evidence of "need for" a project. Another form of evidence would be the requirements of MH's mandate to provide electric power.

The CEAA defines an "alternative to" as a project that is a functionally different way to meet the needs and achieve the purposes of the initial project under consideration. For example, wind power is functionally different from hydroelectric power, and therefore could be an alternative to hydroelectric power. MH/NCN interpreted the "alternatives to" assessment as involving a demonstration that the Projects are more beneficial than other projects, either similar in nature or significantly different, but in all cases serving the same need.

The Commission has used these definitions to guide its examination of the NFAAT issues in this chapter.

6.1.3 Previous Review of Wuskwatim and Other Hydroelectric Development

In 1990, the PUB considered MH's capital projects for generation and transmission during the period 1990 to 2009. The 1990 major capital projects submission compared two main sequences of hydroelectric development. The preferred sequence proposed a Conawapa in-service date of 2000 and a Wuskwatim in-service date of 2007. This scenario was underpinned by a proposed 1000-MW sale of power to the Province of Ontario. The preferred scenario without the 1000-MW contract had Wuskwatim coming into service in 2002 and Conawapa coming into service in 2010. Subsequent to the PUB review, the contract with Ontario was not finalized and domestic load forecasts were significantly reduced. Therefore, neither sequence was pursued.

6.2 Business Structure

6.2.1 Overview

MH and NCN signed an agreement in principle (AIP) on September 25, 2001 to develop the Generation Project. The business structure of the Generation Project will take the form of a limited partnership (the Partnership). MH and NCN looked at many different structures and concluded that, primarily for tax purposes, the limited liability partnership was ideal. A 0.01% share will be owned by a General Partner, which will be a wholly-owned subsidiary of MH. MH and NCN will both be limited partners in the Generation Project, with NCN owning a maximum of 33% and the balance of 66.99% owned by MH. The Board of Directors of the Partnership will be proportionate to the equity percentages of MH and NCN. The associated transmission facilities will be owned by MH and will not be included as an asset of the Partnership. MH indicated that it would be subject to no more risk as part of a limited liability partnership than it otherwise would be if it entirely owned the generation assets.

6.2.2 Summary of Understanding

An October 2003 non-binding summary of understanding (SOU) between MH and NCN sets out the major terms and conditions of the Generation Project and provides a framework for negotiation of a binding project development agreement (PDA). The parties expect to complete negotiations of the PDA prior to start of construction. MH and NCN have testified that the final PDA will not differ significantly from the SOU. It is expected that NCN members will vote on the PDA in late 2004, with approval likely requiring a double majority. (A double majority requires 50% participation of all eligible voters, with 50% plus one voting in favour of the Projects.)

The SOU outlines the status of the understanding achieved by MH and NCN since the date of the AIP to the hearing date. The SOU outlines numerous contracts that the General Partner will enter into with MH, including the Management Agreement, the Construction Agreement, the Project Financing Agreement, the Power Purchase Agreement, the Systems Operation Agreement, the Maintenance and Operations Agreement, and the Interconnection Agreement. In addition, NCN will enter into an Adverse Effect Agreement with the Partnership and an NCN Financing Agreement with MH and approved lenders.

The SOU states that it is *"not intended to alter Aboriginal or treaty rights recognized and affirmed under Section 35 of the* Constitution Act, *1982, the Northern Flood Agreement (NFA), the 1996 Implementation Agreement, the Treaty Land Entitlement Agreement, nor is it intended to constitute authorization for the taking or using of reserve lands without consent of NCN and its Members for purposes of Section 35 of the* Indian Act."

6.2.3 Fundamental Features

There are a number of provisions in the SOU to protect the partners' interests in the event of such developments as a change in the General Partner, any sale or absolute assignment by MH of its rights and obligations, sale by MH of its interest in the General Partner or partnership units, a change in auditors, a change to notice provisions for calling meetings and the issuance of any further partnership units.

The Fundamental Features section of the SOU defines the basic concepts under which the project is to be built. These features were fundamental to NCN's decision to participate in the Generation Project and cannot be changed without consent of NCN. They are:

- Location of the construction camp in the vicinity of Taskinigup Falls on the north shore of the Burntwood River
- Location of the Access Road
- Location of the transmission lines
- Range of water levels on Wuskwatim Lake
- Reservoir storage so that water levels on Wuskwatim Lake will not typically rise above approximately 234.0 m asl (excluding wind and wave effects)
- Daily water levels on Birchtree Lake

The Generation Project must operate within conditions imposed by the CRD 1973 Interim Water Power License, the 1976 City of Thompson Agreement, the NFA and the 1996 Implementation Agreement.

6.2.4 Project Construction

A construction contract will be established between the General Partner and MH. MH will plan, design, engineer, construct and commission the Generation Project. The General Partner will have a Construction Advisory Committee to keep the limited partners informed of the progress on the Projects and any issues that arise.

6.2.5 Adverse Effects

The SOU contains information about the Adverse Effects and Compensation Agreement between the Partnership and NCN. This agreement, which recognizes the efforts of MH and NCN to avoid adverse effects of the Generation Project, makes provision for adverse effects that cannot be mitigated. To date, the compensation provision has not been finalized. MH stated that the compensation would be the same regardless of whether or not NCN was a partner.

6.2.6 Capital Requirements and Financing

The capital requirements will be the total of all the Generation Project's costs, net working capital requirements, and future capital expenditures. Each limited partner will be responsible for its *pro rata* share of the capital costs. Cash calls will be required to fund additional capital requirements if the debt ratio exceeds 85% in the first ten years of operation, or 75% anytime thereafter.

NCN will require financing from a number of sources for their capital contribution. NCN will issue a promissory note to the General Partner for their equity. NCN will then pay for the promissory note through a loan from MH and other approved lenders. NCN may also obtain some of the required financing from the Government of Canada, and use interest income from the trust established under the NFA Implementation Agreement for financing purposes.

Until the loan to MH is repaid, any income distributions from the Partnership on the portion of units financed by that loan, called Loan Units, must be used to pay down interest and principle on the loan. There will be no restrictions on income distributions that correspond with units directly financed by NCN or a third party. Therefore, NCN will earn income prior to full payment of its loan to MH. MH and NCN have forecast that NCN will be able to repay loans to MH by 2027 under the low export-price scenario and by 2015 under the high-export-price scenario. Under the SOU, NCN has until 2035 to repay the equity loan. (The pricing scenarios are discussed in Section 6.4)

6.2.7 Power Purchase

The power generated by the Generation Project will be sold to MH under the Power Purchase Agreement. On-peak and off-peak power will be sold at the Long-Term Transaction Rate and the Opportunity Transaction Rate, respectively, which are based on actual export prices realized by MH. Although the Generation Project is estimated to be needed for domestic purposes in approximately 2019, the purchase price of power will remain at the export prices indefinitely. MH considered the export price, which was determined through negotiation, to be the best indicator of wholesale power and the incremental benefits to MH and to Manitoba customers. Even when the power is used for domestic load, it will be providing substantial export benefits in non-drought years. In addition, the market price would be an indicator of the cost of other resource options. MH added that in the situation where there was no power to export, the domestic rate would not be subsidized by exports and the domestic rate would approach the rate being charged in the export market. MH likened NCN's portion of the Project to that of a non-utility generator, which would also earn revenues at the export price. MH concluded that the arrangement with NCN will have significant upfront benefits, and while it may cost the company in the latter years of the agreement; it will be advantageous overall to MH and its customers.

6.2.8 Power Supply and Management

According to the SOU, MH will enter into a Management Agreement, a Power Supply and Management Agreement and a Maintenance and Operations Agreement with the General Partner. Under the Management Agreement, MH will manage the business and affairs of the Partnership on behalf of the General Partner. These agreements will make MH responsible for operation of the units, setting of the unit output, adjustments of spill and planning and management of scheduled maintenance. The General Partner will reimburse MH for all its direct and indirect costs, including overhead, withholding taxes, payroll taxes, water-rental and similar levies.

6.2.9 Pre-Project Training

The SOU outlines commitments to provide training to NCN and other northern Aboriginal people. The Partners have committed up to $5-million of the Generation Project funds for pre-project training. In addition to the training funds from the Partnership, funds will also be received from the Government of Canada and Government of Manitoba. Seventy-five percent of these funds will be allocated to NCN for pre-project training of Cree Nation members and residents of the Nelson House Northern Affairs Community. Twenty-five percent will be available for pre-project training of other northern Aboriginal people.

Project training funds will be directly linked to the skill acquisition of members for work on the Projects, primarily for designated trades training, non-designated trades training, and training for construction-support services. A portion of these funds may also be used for business- and professional-skills training directly related to the Projects. NCN has developed a multi-year pre-project training plan. The active and additional funding support of the Governments of Canada and Manitoba will be required to achieve the objectives of this NCN plan.

The community-based training of NCN members will be delivered through the Atoskiwin Training and Education Centre (ATEC) in Nelson House. ATEC will assume full responsibility for NCN's multi-year training plan, which has been underway since August 2002.

It has been proposed that Manitoba Advanced Education, Training and Youth (MAET) administer $1.25-million of the funds related to training Northern Aboriginal individuals for these projects. Funding will be provided on an individual basis rather than a community basis.

6.2.10 Employment and Business Opportunities

While NCN members will be given preference regarding construction employment and business opportunities, MH has stated that no person is guaranteed a job. The construction will take place under the Burntwood Nelson collective agreement (BNA). In addition to MH stating that every effort will be made to provide employment opportunities to NCN members, preference will be given to northern Aboriginal persons who are union members followed by northern Aboriginal persons with the necessary skills. Union members from southern Manitoba will not be employed ahead of non-union members from northern Manitoba who have the necessary skills.

Additional conditions will also be imposed in the tendering process to ensure that contractors set reasonable requirements for accreditations, skills and experience necessary for the particular work to be performed, that contractors provide on-the-job training to workers in specified trades and that they submit details of the proposed on-the-job training programs. An Employment Advisory Committee will be established to monitor and address concerns arising from the referral and hiring process composed of MH, NCN, MAET, Hydro Projects Management Association, contractors and the Allied Hydro Council of Manitoba.

6.2.11 Transmission Development Fund

The Transmission Development Fund (the Fund) is intended to provide enduring annual benefits to Aboriginal communities that pursue traditional land-use activities on Crown lands newly reserved by MH for the development of major transmission facilities.

The size of the Fund, which would be funded solely by MH, would be based on a 5% portion of eligible capital costs. Eligible capital costs are defined as new major transmission projects 115 kV or greater, subject to licensing under *The Environment Act*, located on Crown land newly reserved for MH. It is estimated that this would establish a fund of approximately $7.8-million in 2002 dollars.

The fund would be initiated with the start of construction of the associated transmission facilities. Funds are to be used to achieve community improvements, as determined by the appropriate governing authority. Communities will be asked to advise MH annually of the use of the monies in relation to the guidelines and to the achievement of community improvements.

6.2.12 Peace of the Braves Agreement

In response to questions raised by Participants and Presenters, the Commission asked MH/NCN to compare the agreement concerning a New Relationship between the Government of Quebec and the Cree of Quebec (the Peace of the Braves Agreement, 2002), and the Wuskwatim SOU between NCN and MH.

MH/NCN stated that a direct comparison was difficult due to the significantly different nature of the two agreements. The Peace of the Braves sets up a new comprehensive regime in Northern Quebec, provides financial compensation, defines the rights of the Aboriginal communities to practice traditional pursuits and provides for certain hydroelectric developments. Rather than being a project-specific development agreement, the Peace of the Braves is a comprehensive economic, social and cultural agreement between the Quebec Government and the governing authority of the Cree of Quebec. As such it is effectively a modification to an existing treaty. The SOU does not change any existing treaties. The SOU is for specific project ownership and details a business structure for the Partnership. It is limited to the understanding between a utility and a Cree First Nation in relation to a potential limited partnership arrangement respecting a specific hydroelectric project.

6.2.13 Participant Positions – Business Structure

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

Econalysis Consulting Services (ECS), on behalf of CAC/MSOS, stated that since MH had not provided an assessment of business risks associated with its partnership arrangement with NCN, the proposed business arrangement between MH and NCN requires further review. Because of the potential business risks that arise from any partnership, ECS disagreed that MH would be in the same position as if it had developed the project on its own. ECS recommended that MH undertake a full business-risk assessment, including a mitigation strategy and provide this analysis to its Board of Directors prior to requesting final approval of the Projects.

ECS stated that pricing the power at export prices is reasonable until the Projects are required for reliability purposes to meet domestic load. Even after the Projects are required for domestic reliability purposes, it is likely that under a wide range of system conditions, the incremental power available from the Projects will be sold on the export market. ECS noted that although there may be periods of time when the energy of the Projects is required for domestic load (and therefore it will not earn export prices), it must be recognized that the pricing agreement is more than just a transfer pricing arrangement with the Partnership. It forms part of the overall arrangement and agreements with NCN, under which the First Nation is agreeing to the development of the Generation Project.

6.2.14 Presenter Positions – Business Structure

Many Presenters indicated that the Projects are a model of how northern communities can work in partnership with developers like MH to share in the profits and economic opportunities created by the development. They encouraged MH and NCN to maintain the partnership arrangement as a basic linchpin to the Projects, and continue the process for a fair, informed vote regarding the decision of NCN to participate.

The development of the Projects provides northern Manitobans with an opportunity to learn from past experience and create a new model for economic development that can provide training, jobs, and business opportunities. Presenters stated that past experience has taught that the future must be built on honesty, trust, partnerships and mutual benefits.

The Projects present an opportunity that Aboriginal peoples in Manitoba have never had in the past. The Partnership between NCN and MH will explore a new relationship between Aboriginal communities and corporate Canada, and provide a foundation for a strong and vibrant community through promotion of community economic development. The Projects provide a model for collaboration, and allow First Nations to have direct, meaningful and proactive input into the Projects. This structured and organized collaboration between NCN and MH allows for transfer of learning related to large-scale projects, and instills confidence in the business community that Aboriginal people can take part in large-scale initiatives. The Projects allow community and economic development, self-reliance, a better future, employment opportunities and a higher quality of life without people having to leave home. A successful partnership must include meaningful ongoing discussions and checks to deal with issues of mitigation and management. NCN will have an influence and will not just be an object of change.

However, concerns were expressed about MH making promises 50 years ago that were not kept. Some questioned where the funding for NCN's equity share would come from and indicated that NCN's existing funds should be used for the community instead of the Generation Project. It was also stated that NCN should not take on risk for a project that is on NCN land. One Participant suggested that NCN members should be allowed to invest in existing MH generating stations instead of the Projects, so as to focus on conservation.

It was pointed out that in northern Manitoba, unemployment rates are significantly higher in reserve communities than in the urban centres, and that the link between employment and social distress is well-documented. Demographic trends indicate that the population of northern Manitoba is young, and getting younger. These new entrants to the labour force need marketable skills and employment opportunities, which are scarce in most northern communities.

Aboriginal communities are a growing and significant pool of potential employees for all Manitoba employers, including MH. Everyone must work with them to ensure that they are afforded every opportunity to receive the education and training they need to be able to fill the void existing in the labour force. The basic life-skills training provided in anticipation of the Projects as well as the ongoing trades training, will enhance the skilled-labour pool. Construction jobs are unionized, good-paying jobs that provide opportunities for an improved standard of living. In addition, the skills that are acquired on the Projects can also be utilized in northern communities for residential house building, as well as for other community developments.

Presenters indicated that all will have to work together to ensure that systemic barriers experienced on past hydro projects are not encountered with the Projects. Some Presenters felt it was crucial that local communities review the Projects and the MH/NCN partnership.

Some Presenters questioned whether higher paying jobs are guaranteed for the people of NCN. They were concerned that the promises given by MH during the CRD were not kept and questioned whether the promises being made regarding the Projects would be kept.

It was noted that the construction phase of the Projects would put pressure on some of the service industries in the North, especially, but not limited to, those in NCN and Thompson. There would also be social problems arising from the influx of people and to the region, but it was felt if communities were informed ahead of time, the issues could be managed.

6.2.15 Commission Comments and Observations – Business Structure

The Commission acknowledges the efforts of MH/NCN in the development and ratification of an AIP regarding development of the Projects. The Commission understands that the SOU, while not legally binding, sets out a series of topics to be discussed between the parties leading to the development of a binding PDA. This PDA will be subject to a ratification vote of NCN members and approval of MH.

The Commission accepts that the Business Structure and the major terms and conditions of the SOU result from negotiations between MH and NCN, which includes TSK and WSK. The Commission respects the negotiations that have taken place and accepts that this type of partnership will be beneficial to both parties. However, the Commission has concerns regarding the Power Purchase Agreement, in that power will be purchased from the Partnership at export prices regardless of whether or not the energy from the Projects is required for lower-priced domestic load. The Commission was advised that in most years, excess power will be available for export and the price paid to the Partnership will be indicative of the benefit received by MH. However, the Commission cautions that over the long-term MH may not be able to recover the export revenue equal to or greater than the price paid for the power purchased from the Partnership.

The Commission is of the view that the assessment of risks helps to provide a more transparent process and would have preferred to have seen a review of the business risks associated with the Partnership. Risk analysis will be of increasing importance for future MH projects that are considerably larger and could have a greater impact on the financial stability of MH. The Commission therefore is recommending that all future NFAAT submissions include a risk analysis that includes business risks and quantifies all risks where possible.

The Commission recognizes the economic opportunities created for NCN members and other First Nations and urges MH to ensure proper training opportunities are realized. It will be imperative for MH and its contractors to fully implement life-skills training, on-site counselling, and other programs that assist members of Aboriginal communities to become effective members of the MH workforce. The Commission will be including a requirement to do so in its licensing recommendations in Chapter 7. The Commission looks forward to hearing about the improvements in the training and job opportunities for First Nations, and will expect MH to report its progress related to Aboriginal employment in its annual report.

The Commission recognizes that the Chief and Council elected by NCN members are the appropriate representatives to negotiate business arrangements for the Generation Project on behalf of the NCN people.

6.2.16 Commission Recommendations – Business Structure

Recommendation 6.1

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric projects be required to include an analysis of all risks, including business risks, and, where possible, the risks should be quantified.

6.3 Project Costs

The Projects' costs will be comprised of capital and production costs. The $900-million capital-cost estimate includes all of the construction costs for the Projects, including labour, materials, capital taxes, contributions to the Transmission Development Fund and estimates for environmental mitigation and compensation costs. The production costs include all costs related to the operation of the Projects once completed. The total project costs include expenses incurred to date and an estimate of expenditures required to complete the Projects.

6.3.1 Capital Costs

MH/NCN and the primary engineering consultants, Acres Manitoba Limited (Acres), investigated key engineering, economic and environmental factors to produce investment-grade cost estimates. MH/NCN indicated that the studies were directed by senior experienced staff and subjected to review. MH, in combination with Acres, has extensive experience and internationally recognized expertise in hydroelectric project engineering and construction, particularly with the type of geology, hydraulics and construction conditions prevalent in northern Manitoba.

Assuming an in-service date of 2010, MH/NCN indicated that the Projects' total capital cost including the generating station and associated transmission facilities, is as shown in Table 6.1.

Table 6.1
Wuskwatim 2010 In-Service Date ($millions)

Cost Type	Sunk Costs	Estimate Net of Sunk	Total Estimate
Generation Station	62.69	525.29	587.98
Transmission Lines	2.50	63.62	66.12
Transmission Stations	.91	55.11	56.02
Total	66.10	644.02	710.12

In addition to the $710-million cost for the generation station, transmission lines and transmission stations, the total capital costs of $900-million include interest and escalation of approximately $190-million. MH's sunk costs of $66-million include expenditures that have already been incurred or are committed to be incurred.

While an estimate for environmental mitigation and compensation costs was included in the estimate, the amount was not disclosed during the hearing since disclosure would prejudice the negotiations of such amounts. However, MH indicated that the provision in the capital costs was well above what MH expected to be the final settlement amount.

Uncertainties in project construction variables were incorporated into the estimates through a range-estimating cost-risk analysis performed by Decision Science Corporation. MH used the range-estimating approach for the Generation Project, which represents over 80% of the overall project costs. Uncertainties in costs were accounted for by assigning a cost range to each of the major and key cost components. The estimates indicated that, with a 90% confidence level, costs will be within -8% to +9% of the estimated cost.

In March 2002, MH retained Both Belle Robb Limited (BBR), a consulting firm, to conduct an independent overview of the range-estimating process, assumptions, and major inputs used to arrive at the Generation Project cost estimates. BBR concluded that the range-estimating approach used by MH to prepare the estimate was consistent with prudent estimating practice. The method of risk analysis has determined a contingency amount that is consistent with traditional rule-of-thumb methods. In addition, the risk-analysis method reduced subjectivity in the estimating process. BBR indicated that the basic mitigation compensation expense might be underestimated. However, BBR also found that the amount of contingency determined in that analysis should be sufficient to accommodate variations in the cost factors that might be experienced.

MH used traditional methods to estimate transmission costs, which are a small portion of the overall cost. Given MH's extensive and ongoing experience with the construction of transmission facilities, estimates were judged by MH to be accurate to within +/- 20%.

MH/NCN's exploration of alternative transmission-route concepts, included a route along Highway 6, (the Highway Option) that did not infringe on the NCN Resource Management Area. The Highway Option resulted in an increase in capital costs of $35.6-million, a 54.8% increase over the preferred route. The increase in capital costs resulted mainly from the additional 176 km of transmission lines. The Highway Option would also have additional operating expenses of $300,000 per year, due to transmission-line losses. (Line loss is the power lost in the transmission between one point and another.)

Given the importance of estimating capital costs, MH indicated that it has the following controls in place related to construction costs:

- Significant project planning and risk assessment to be done during the early stages.
- Temporary facilities, such as the camp, will be designed and operated in a manner that will promote job satisfaction and harmony.
- The project will be constructed under the provisions of the Burntwood Nelson collective agreement (BNA), which is a no-strike, no-lockout agreement.
- Work activities will be awarded through a public tendering process and/or awarded through MH's Northern Purchasing and Hiring policy initiatives.
- The construction activities will be managed by a project group made up of internal staff and consultants from various disciplines and will be supported by a technical and administrative service group.
- MH has an established reputation for staffing construction projects with competent personnel.
- Support will be provided from MH's other disciplines as well as those of their consultants.
- A review will be conducted by internal and external auditors.

6.3.2 Production Costs

Production costs were determined through the simulation of the operation of the integrated MH system. Fixed and variable production costs were included, while capital and financing costs that will occur once the Projects are in-service were excluded.

The fixed production costs include costs of

Table 6.2 Total production costs

	Wuskwatim 2009 In Service Date (note 1) Export Price $ billions (note 3)		**Wuskwatim 2020 In Service Date (note 2) Export price $ billions (note 3)**	
Revenue/Cost Type	**High**	**Low**	**High**	**Low**
Export Revenue	20.4	14.3	19.3	13.6
Fixed Production Costs (note 4)	2.5	2.5	2.5	2.5
Variable Productions Costs (note 5)	7.0	5.7	7.1	5.7
Total Production Costs	9.5	8.2	9.6	8.2
Net Revenue	10.9	6.1	9.7	5.4

1. Assuming Wuskwatim 2009, Gull/Keeyask 2023, SCCT (120 MW) 2034
2. Assuming Wuskwatim 2020, Gull/Keeyask 2023, SCCT (120 MW) 2034
3. Figures are in constant 2002$ and do not reflect the time value of money
4. Fixed production costs do not vary with water supply and include fixed operating and maintenance costs and thermal demand charges.
5. Variable production costs vary with water supply and generation and include water-rental, thermal fuel, variable operating and maintenance and import costs.

operation and maintenance of the generating plant that are not dependent on the quantity of generation. Variable production costs are correlated with the quantity of generation, which, in turn, is dependent on water conditions and include fuel costs, variable operation and maintenance costs, import-energy costs and water-rental charges.

Total production costs for the period 2009 to 2038 under both the high-price scenario and the low-price scenario are shown in Table 6.2.

MH stated that future major rehabilitation (for example, shutting down the generation station to replace a turbine) and associated station outages were not specifically included in the production costs. These costs are not expected to be incurred for a number of years and, due to the time value of money, the impact to the analysis is not significant. Costs associated with various joint committees involved in the construction and operation of the Projects have not been included in the production costs, but MH/NCN indicated that these amounts are expected to be small. Water-rental costs were included at current rates. While MH had no indication that water-rental rates would increase in the future, these rates have increased in the last 10 years and are set at the discretion of the Government of Manitoba.

6.3.3 Participant Positions – Project Costs

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

ECS stated that MH/NCN have understated the financial risks associated with the Projects, particularly in the areas of capital costs, inflation, and interest rate differentials. As a result, MH's performance in the management of the Projects should be reviewed in the future by an appropriate body. ECS recommended that the PUB require MH to provide evidence comparing actual cost to forecast costs in respect of scheduling and capital expenditures. It also recommended that the PUB review any material changes in the estimated in-service date or costs of the Projects.

Community Association of South Indian Lake

CASIL strongly urged the Commission to recommend that MH be required to prepare and publicly disclose, as a specific condition of any license for Wuskwatim, a preliminary full-cost accounting of the Project after the first fiscal year of operation, a more refined accounting after 10 years, and a final accounting after 20 years of operation. This accounting must include all direct and indirect capital operations and maintenance, mitigation, compensation, monitoring, consultation, and documentation costs for the Projects. MH must use the most current state-of-the-art accounting techniques for estimating environmental damage and values.

Canadian Nature Federation

Mr. Patrick McCully, Campaign Director, International Rivers Network, presented information from the World Commission on Dams, on behalf of CNF, which reported that internationally, 56% of 81 dams had construction-cost and time overruns. He indicated that the largest overruns took place in South Asia and that he did not have cost statistics on Canadian dams.

6.3.4 Commission Comments and Observations – Projects Cost

The Commission recognizes the considerable skills and experience of MH/NCN and its consultants in developing the capital- and production-cost estimates. In addition, the Commission notes that while some questions were raised about cost overruns in totality, the Participants did not focus on the specific quantum of the estimates but rather on the risks associated with those estimates. Overall, the Commission concludes that MH/NCN have performed appropriate due diligence with respect to capital and production cost estimates.

While proper planning can manage or reduce some of the risks associated with the Projects, the Commission is of the view that significant risks may exist with respect to a number of cost components such as the costs of delay, generation-station construction costs, mitigation and compensation costs, and water-rental rates. With respect to the financial evaluation of the Projects, the Commission is of the view that these risks would increase the hurdle rate required for the project, as is discussed later in this chapter. Further, an appropriate authority, likely the PUB as part of MH's future General Rate Applications, should monitor the costs and benefits of the Projects.

The Commission accepts MH/NCN's position that there is generally no cost saving to be achieved by following existing rights-of-way. In fact, the option than ran parallel to the highway right-of-way was estimated by MH/NCN to cost an additional $35.6-million due to the additional line length. Additional line losses would also increase annual operating costs by over $300,000.

6.3.5 Commission Recommendations – Project Costs

Recommendation 6.2

The Clean Environment Commission recommends that:

The Government of Manitoba grant the Public Utilities Board jurisdiction to review, on an ongoing basis, as part of Manitoba Hydro's future General Rate Applications, the actual revenues and costs of the Projects relative to forecast, along with the impact of the Projects on Manitoba Hydro's financial stability and its domestic rates.

6.4 Export Market

6.4.1 Load Forecasting

MH stated that it used a very sophisticated load-forecasting methodology. The residential end-use forecast is prepared using a detailed, multi-step approach. The residential customer forecast is separated into Basic Standard (having no capability for electric space heat) and Basic All-Electric (having electric space-heat capability) classifications, using a market-share model that accounts for 99% of all residential sales.

The forecast for the general-service customers uses an econometric regression that relates electricity sales to previous electricity sales, the real price of electricity and the real gross domestic product of Manitoba. The general-service Top Customer forecast is prepared using an intensive, customer-specific process, during which key and major account staff visit each customer to review future business plans and obtain detailed information on the customer's future electricity demands. Historic data is extrapolated to estimate Roadway Area Lighting and distribution and transmission-line losses, while construction-power estimates are based on expected construction activity.

Based on the 2002 load forecast, total net firm energy is projected to increase 269 GW.h per year, or 1.2%, which is slightly lower than the ten-year annual growth rate of 280 GW.h per year. The growth in total net firm energy from actual 2002 to forecast 2003 was 522 GW.h or 2.5%. MH noted that forecast growth figures are below historical growth rates, which provides supporting evidence that MH is not making forecasts based solely on historical trends.

MH has been improving its load-forecasting methodologies since the late 1970s and now has a set of methodologies that are providing forecasts with accurate results. Using a five-year average, forecasts were 0.9% lower than actual net firm energy, and using a 10-year average, forecasts were 4.1% higher than actual.

6.4.2 Surplus Energy Available for Export

Two types of surplus energy are available when a system is built to service firm domestic load; firm surplus and opportunity surplus. Firm surplus arises because construction of a large plant will produce energy that is initially surplus to domestic requirements, and can be sold to the export market. Sales of firm energy are based on a dependable supply of energy that is not required by the domestic load. Export sales contracts are normally one-to-15 years in duration and customers generally enter into these contracts as alternatives to building their own generation facilities. Firm sales are priced higher than opportunity sales because the purchaser is able to avoid alternative generation costs.

Opportunity surplus energy arises from the variability in water flows at hydroelectric plants. While generation is planned at the lowest or dependable flow, in most years there will be higher flows and subsequently more available energy. Opportunity sales can be either short-term or spot-market sales of this non-firm or interruptible surplus power. These sales are dependent on water supply and are often negotiated just prior to delivery, which results in price volatility. The revenues from opportunity sales are affected by such factors as maintenance and forced outages, fuel costs, weather variability and market psychology.

The quantity of energy exported is determined by the quantity of generation surplus over domestic load, by the availability of interconnection capability, and the existence of an export market of sufficient size. To estimate future export energy, supply and demand tables were utilized to summarize surplus generation on the basis of median hydro generation. A computer simulation of the operation of the MH system of reservoirs and generating resources (the SPLASH model) was utilized to determine the expected export revenue for each year of the project-analysis period to 2036/37. MH is confident that adequate interconnection capability will be available to export the incremental power generated from the Projects.

The capacity of MH's interconnections to markets in Canada and the US are estimated to be 2,500 MW, after consideration is given to simultaneous power flow, operating margins and reserve margins. After operating limitations and market limitations, the firm capability for on-peak export power is 2,300 MW. MH stated that by advancing Wuskwatim to 2010, MH will be able to market the increased surplus energy at on-peak prices under the majority of water-flow conditions.

MH maintains a mixed portfolio of export sales based on firmness, magnitude, duration, customers, and indexing. Historically one half of revenues have been from firm sales and one half from opportunity sales based on energy, but this can range from 45 to 75% based on pricing.

Both firm and opportunity power can

either be sold during on-peak times or off-peak times. Since the highest prices are for on-peak energy, MH attempts to maximize on-peak sales.

MH has a number of marketing programs to maintain current contracts and source new contracts. MH estimates that there will be no incremental expenditures from marketing the incremental power from Wuskwatim.

6.4.3 Export Demand

Because Canadian export markets are limited, MH has focused marketing efforts largely on the US export market. A large export market for MH's surplus electricity exists in the MAPP/MISO area (MAPP stands for Mid-Continent Area Power Pool, MISO for the Midwest Independent System Operator), which includes Minnesota, Nebraska, North Dakota, Manitoba, Saskatchewan, Wisconsin, Montana, Iowa and South Dakota. (See Figure 6.1) Demand in the MAPP area is expected to grow by 2,100 MW by 2010 and by 9,600 MW in the next 20 years. MH currently exports to 37 customers, down from 48 due to the collapse of Enron and the amalgamation of energy marketing companies. MH expects that customer numbers will increase as transmission barriers diminish.

While MH was confident that the Project's power can be sold, MH is pursuing several sales opportunities to maximize the price. MH added that it could manage the profitably of up to an additional capacity of 620 MW in 2012, but would have difficulty managing an additional 1,000 MW of capacity without an underlying long-term fixed contract.

It should be noted that MH's export contracts have a provision that, if necessary, MH can use energy committed for export to serve domestic load prior to serving the export obligation.

6.4.4 Forecast Export Price

One of the most important factors in evaluating the feasibility of the Projects is the forecast price of export energy. In general, export prices are expected to increase moderately due to increased fuel costs and increased emphasis on environmental considerations associated with emissions of greenhouse gases and other pollutants. There is great uncertainty over the degree and timing of regulation and legislation related to emission limits. Therefore a range of possibilities was used to project export prices.

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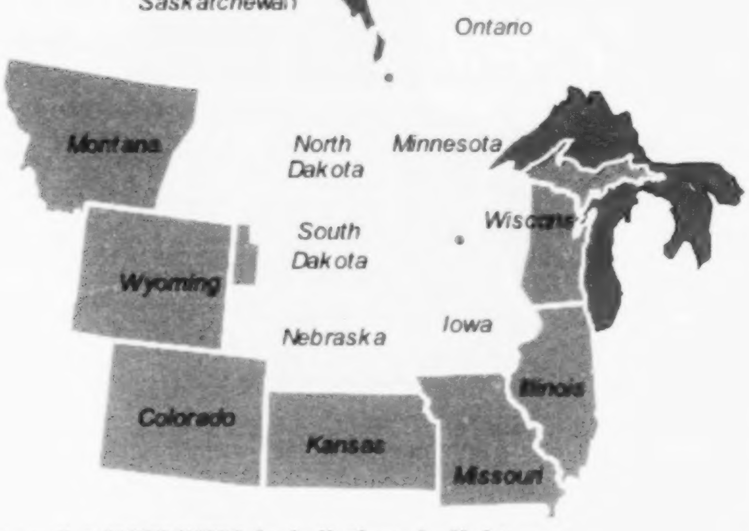

Figure 6.1 MAPP/MISO jurisdictions in light gray.

either be sold during on-peak times or off-peak times. Since the highest prices are for on-peak energy, MH attempts to maximize on-peak sales.

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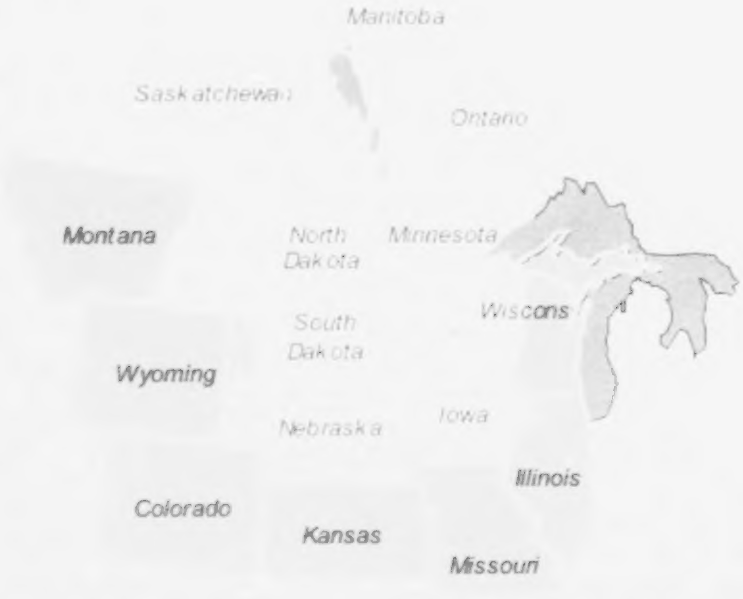

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power prices, MH retained Global Insight (formerly DRI-WEFA) and also purchased off-the-shelf forecasts from three other consultants, Henwood Energy Services (Henwood), LCG Consulting (LCG), and ICF Consulting (ICF). An off-the-shelf forecast is one that is purchased by MH with no customization.

The consultants came to the following conclusions:

- Global Insight found that energy prices will increase greater than inflation.
- Henwood expected low growth in energy prices to 2006, with a more rapid rise between 2007 and 2012, and energy prices following natural-gas prices thereafter.
- LCG found that there would be low increases in early years, with rapid rises to 2015, then stabilization thereafter.
- ICF found that energy prices would follow natural-gas prices.

MH considered the four consultants' forecasts in developing its reference export price. The forecast includes an annual price for firm on-peak export power to 2037 and monthly prices for on-peak and off-peak opportunity export sales. An environmental premium is the additional cost component that MH realizes for export prices as a result of more stringent regulation for natural-gas and coal generation relative to hydro generation. Four environmental scenarios were selected to represent a range of potential regulatory and legislative developments relating to price.

- No Environmental Export Premium (Reference Scenario)
- Low Environmental Export Premium Scenario
- Medium Environmental Export Premium Scenario
- High Environmental Export Premium Scenario

Probabilities were assigned to each of the scenarios in developing MH's forecasts. MH used expected-forecast-of-power prices for export comprised of a reference price combined with various weightings on a year-by-year basis of the environmental price premiums. MH did not disclose the expected export prices due to commercial sensitivity of the information.

For purposes of the hearing, MH developed a high and a low forecast that established a set of bounds for the expected export price. MH stated that these forecasts could be used in a sensitivity analysis to assess the range of economic benefits and financial impacts. (Sensitivity analysis is a simulation analysis in which key variables are changed one at a time, allowing for observation of the resulting change in the rate of return.) Historically, MH has understated the forecast of export prices when compared to actual prices.

The low-forecast scenario was based on recent prices for firm and opportunity export sales. The low export price would be likely under conditions with long-term world-wide geopolitical instability, low economic growth, aggressive energy conservation policies, low growth in energy demand, loss of momentum in electricity industry re-regulation, low natural-gas prices, reduced electricity and natural-gas price volatility, and the US moving to self-sufficiency in energy supply. The high-forecast scenario would occur in a stable geopolitical world, with high economic growth, high growth in energy demand, a rapid move to competitive power markets, high and volatile natural-gas prices, the US aggressively regulating environmental pollutants, and the US ratifying a Kyoto-like agreement. MH indicated that the Projects would remain economic under the both the high- and low-price scenario.

6.4.5 Participant Positions – Export Market

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

ECS stated that, while there appears to be low risk associated with MH's ability to market all the energy it can transmit to the US over existing interconnecting transmission lines , there is a significant risk associated with the prices such sales will command. Further, the timing of future environmental regulations and the evolution of the electricity markets is critical to the advancement of the Projects.

Displaced Residents of South Indian Lake

During the hearing, DRSIL, assisted by PCN, brought forth evidence whereby MH indicated at a Minnesota State Senate Hearing that the Projects would be required for domestic use by 2010. DRSIL purported that the inconsistency between statements at that hearing and the evidence put forth by MH in this hearing highlighted that MH could not be trusted.

DRSIL also recommended that the contracts for the export sale of power be signed and confirmed before the Projects are approved.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

TREE/RCM stated that the forecast of the future demand for electricity in Manitoba is one of the central pillars of Manitoba's rationale for proposing the Projects. They said MH's approach to the future demand for electricity is superficial and passive. It fails to provide the business planning function in MH with the type of analysis needed to properly prepare for uncertain futures or allow for identification and exploitation of new opportunities for fulfilling the organization's business and public mandate.

TREE/RCM submitted that most of the future demand for electricity in the Load Forecast is based on extrapolation of past trends and aggregate ratios such as the price of electricity and the gross domestic product, which are the result of uncertain forecasts. The mathematics of the forecasting method contains very little information and detail about the structure of these highly aggregate ratios, thereby limiting the utility of the Load Forecast as a tool for understanding the demand for electricity.

TREE/RCM consultant Mr. Ralph Torrie, of Torrie Smith Associates, recalibrated the Load Forecast for the year 2018 by adjusting assumptions regarding floor-area growth rates. This adjustment resulted in a 450 GW.h drop in forecast commercial-sector electricity demand when compared to MH's Load Forecast. Mr. Torrie noted that his analysis was only for illustrative purposes.

6.4.6 Commission Comments and Observations – Export Market

The Commission accepts that MH/NCN have taken reasonable steps in forecasting export prices and notes that MH/NCN's forecast prices were not challenged during the hearings. The Commission is satisfied that the low- and high-export scenarios represent reasonable bounds for forecasted export prices.

Many Participants tested and analyzed MH's Load Forecast and the impact on energy available for export. While the Participants' positions with respect to the Load Forecast were of some assistance, the Commission is of the view that MH/NCN's assessment of the available export market and the constraints of the transmission system are reasonable.

The Commission notes MH's commitment that there will be enough capacity to maximize the benefits of both DSM and SSE initiatives and the Projects.

The Commission recognizes the concerns brought forth by some of the Participants with respect to MH's statements at the Minnesota State Senate hearing and is of the view that the inconsistencies do not assist in maintaining MH's credibility. The Commission is confident that it can rely on the evidence submitted at this hearing, but would caution MH that it is important that it takes care in this regard.

6.5 Economic and Risk Evaluation

6.5.1 Economics and Internal Rate of Return

MH/NCN determined that the Projects were advantageous to pursue and thus a real internal rate of return (IRR) evaluation was completed. The real IRR is the annual economic return on total investment expected from a project, excluding inflation. The evaluations included impacts of the Projects without reference to the MH and NCN partnership parameters or interests.

To determine the IRR for the Projects, MH examined the changes in the incremental revenues and costs as a result of advancing the Projects to 2009/10 compared with two base-case scenarios. The Neutral Base Case assumed the addition of simple cycle combustion turbines (SCCTs) to meet future domestic energy demand as opposed to new hydraulic generation. The Wuskwatim Advancement Case assumed MH's current power resource plan and an in-service date for the Projects of 2019/20.

The economic analysis used all costs and benefits expressed in 2002 base dollars. The costs included generation capital costs, transmission lines, transmission stations, annual operating and maintenance costs, incremental water rentals, transmission-development-fund payments, and capital-tax payments. Sunk costs were excluded from the analysis.

The revenues include electric-power sales and system-operation benefits such as reduced imports or thermal usage. The IRR was determined for the expected export price, as well as the low- and high-export price forecasts to illustrate extreme market conditions. MH considers these to be representative of the reasonable outer boundaries of possible future export prices.

The advancement of the Projects results in reduced operating costs because use of non-hydro resources and imports will decrease. As well, surplus energy would be sold on the export market until domestic load grows beyond existing resources. In the Wuskwatim Advancement Case the IRR for the Projects under the expected export price is 10.3% and under the low and high export price it is 8.5 and 12.3% respectively.

6.5.2 Risk Evaluation and Hurdle Rates

MH deems a project to provide economic and financial benefits to MH consumers if it offers long-term rate savings with no deterioration in the MH's financial stability in the early years of service. A further indication of economic benefits is whether the project IRR meets or exceeds the risk-adjusted hurdle rate. This is the rate at which the Project would be financially beneficial. The hurdle rate is based on the level of project risk, which in turn is dependent on non-economic and economic sensitivity analysis.

MH/NCN concluded the economics are

sufficiently robust for this Project to be considered low-to-medium risk. Therefore, the Project should be assessed against a hurdle rate that is between 6 and 10%, with the lower bound of the hurdle rate being MH's weighted average cost of capital (WACC).

In MH's view, any IRR over the WACC would be profitable, however, a hurdle rate in the top half of the range is more desirable since it offers a buffer for having taken on more risk.

6.5.3 Sensitivity Analysis

In addition to a comparison with other resource options, MH/NCN analyzed a number of sensitivities, by adjusting the possible changes to export prices, capital costs, water flows, supply and demand, and potential schedule delays. Appendix C details the resulting IRRs for the sensitivities analyzed.

The largest risk to the Projects is future export-price uncertainty. Scenarios C, D, O and P in Appendix C examine the impact of high and low export prices. The IRRs range from 8.0 to 12.3% under these scenarios.

Scenarios I and J in Appendix C result in an IRR of 9.2 and 11.7% respectively, as a result of an increase or a decrease in the capital costs of $95M or 15%. This range encompasses MH's estimate that the capital costs for the Generation Project will be -8 to +9%, with a 90% confidence level, and the Transmission Project costs could be +/- 20% of the estimates.

In scenarios L and M, the +/-300 MW interconnection capability sensitivity was evaluated to assess the impact of several potential risks associated with either a supply or demand uncertainty beyond 2009. These risks included future increases or decreases in interconnection capability and/or interconnection ratings or use of interconnections by competing marketers and as a proxy for deviations in Manitoba load growth, and development of additional DSM, SSE, and alternative energy capability. The analysis indicates IRRs of 10.5 and 10%, respectively, which remain within the hurdle-rate range.

MH indicated a delay of one year to complete construction from 2009 to 2010 results in a 0.1% decrease in IRR from the Wuskwatim Advancement Case.

The analysis implicitly accounts for inflation variability and some interest-rate variability. Overall, the sensitivity analysis indicates that the Projects remain within or above the hurdle-rate range of 6 to 10% in each of the tested scenarios.

6.5.4 Economic Conclusions by MH/NCN

MH/NCN believes future risks associated with construction and operation of the Projects have been considered and judged to be manageable. Overall risks are minimal because it is a small plant with low environmental impacts that has the support of the local community. Its power can be sold with little risk of market saturation, and the joint development by MH and NCN reduces risks of formal challenges or opposition to the Projects during permitting or construction.

MH/NCN concluded that the Projects have an acceptable IRR, and are compatible with development of further DSM and SSE, and the development of alternative energy. Gull/Keeyask and Conawapa in-service dates could be delayed as a result of advancing the Projects to 2010.

MH/NCN noted that additional benefits also exist that are not included in the economic analysis. These include reliability for domestic customers, provision for higher than forecast domestic load growth, Aboriginal and Northern employment opportunities, and benefits to the Manitoba economy.

6.5.5 Participant Positions – Economic and Risk Evaluation

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

ECS was of the view that IRR is an acceptable methodology for establishing the economic benefits of a proposed project. However, the IRR analysis should be undertaken from a MH perspective, rather than from a project perspective.

The Projects likely qualify as low to medium risk with the hurdle rate somewhere in the upper half, or the 8 to 10% range. The reference case should include all economically attainable DSM, SSE, private wind-power developments, and Wuskwatim with an in-service date as required to meet current reliability-planning criteria. Adopting this base case would likely produce an IRR in the order of 9.0%, indicating that the project is economically acceptable, but not by the significant margin originally suggested by MH and NCN.

When using the revised base case and possible variations in critical success factors such as capital costs or export prices, the IRR could fall to less than 8.0% and under a worst-case scenario, an IRR could fall under MH's WACC.

6.5.6 Presenter Positions – Economic and Risk Evaluation

Presenters indicated that the risks appear to be manageable, and expected that MH will manage these risks under the watchful eye of the Commission and the PUB.

The positives of the Projects far outweigh the negatives due to the joint-venture structure, the minimization of flooding, reduction of systemic barriers through education, training and employment of local residents, and the inclusion of the local communities as stakeholders.

6.5.7 Commission Comments and Observations – Economic and Risk Evaluation

The Commission accepts IRR as the appropriate measure of economic risk, the use of a hurdle rate of 10%, and the conclusion that Wuskwatim is a low- to medium- risk project. The Commission believes that Wuskwatim's IRR is likely lower than that presented by MH/NCN, but it is likely to be within an acceptable range. Finally, for future hydroelectric projects, the Commission would like to see the analysis performed from MH's stand-alone corporate perspective as well as the proposed partnership perspective.

6.5.8 Commission Recommendations – Economic and Risk Evaluation

Recommendation 6.3

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric development projects be required to include internal-rate-of-return-analyses of the project that have been conducted from both a Project perspective and Manitoba Hydro's corporate perspective.

6.6 Financial Analysis

The purpose of the financial analysis is to ascertain whether the advancement of the Projects would adversely affect MH's financial stability during the start-up years and the degree to which the economic benefits could ultimately translate into domestic-customer rate savings. For this purpose, MH/NCN prepared financial statements for MH's Electric Operations, including an income statement, balance sheet and statement of cash flows for 2003 to 2035 (the study period) under the low- and high-export-price scenarios illustrating the impact of the Projects. These financial statements recognize that MH will not be just a partner in an investment, but also constructing the Projects, purchasing the power, providing debt financing and offering a credit facility to NCN.

The financial statements assume NCN will take a 33% interest in the Partnership and MH will partially finance NCN's equity contribution at a rate determined in the SOU. The financial statements assumed an in-service date of 2009. Since the NFAAT was filed in 2003, it has been determined that an in-service date of 2009 is no longer possible. However, the financial statements have not been changed to reflect the later in-service date of 2010. Because the adjustments would be insignificant to the overall analysis, the Commission relied on the 2009 financial statements in its analysis.

Revenues received by the Partnership from the sale of power to MH are based on the actual output of the Generation Project, priced at MH's estimated selling prices for exports. Expenses include transmission-line losses of 9 to 10%, along with a fee to contribute towards the marketing and transmission risks borne by MH. A transmission charge recovers the depreciation, interest, maintenance and operating costs associated with the incremental facilities specifically required to serve the Generation Project. Water-rental rates were assumed to continue at current levels, and estimates of annual operating costs were based on long-run averages, with provisions for minor maintenance. Administration costs of the Partnership would be charged on an actual basis, assumed for purposes of MH/NCN's analysis to be $0.5-million per year, escalating at the rate of inflation. Potential costs from adverse effects and compensation were included in the financial projections as a capital cost but not disclosed during the hearing due to confidentiality concerns.

Two types of analysis were used to compare these financial statements with a base case in which MH constructs the same generating station in 2019/20. The first quantified the incremental impact on MH's net income, debt-to-equity ratio, and interest-coverage ratio, and the second translated these anticipated benefits into longer-term rate savings.

6.6.1 Impact on Net Income

MH's share of net income of the Partnership was determined and consolidated into MH's Electric Operations. MH's net income from the Electric Operations was projected to be higher in every year with the Projects. Even in the low-export-price case, there are beneficial impacts on net income in all but two years of the forecast. Following in-service, the cumulative benefit to MH's net income is expected to be $95-million under the low-export-price scenario, $217-million under the high-export-price scenario and $151-million under the expected-price scenarios by the end of the study period in 2035.

Net income for the Partnership will commence in 2010. Under the low-export-price scenario, Partnership net income is projected rise from $5-million to $77-million by 2035. Under the high-export-price scenario, it is projected to rise from $25-million to $170-million by 2035.

6.6.2 Impact on Debt-to-Equity Ratio

The debt-to-equity ratio, a measure of the relative size of a company's debt to the value of its total worth, is an important measure of corporate financial strength. MH's current debt-to-equity-ratio target is to achieve 75% debt and 25% equity by 2011/12. MH has not yet met this target. However, MH indicated there is no significant consequence to higher debt as long as MH moves towards the target level.

While the capital structure of the Partnership is expected to be 75% debt and 25% equity, during the first ten years of the project, the debt may be allowed to temporarily rise to 85% to accommodate start-up losses. The debt-to-equity ratio will be a primary parameter in determining the portion of profits that may be distributed as dividends. Cash calls from the partners will be required if the debt ratio rises above 85% in the first ten years or 75% thereafter.

MH/NCN's financial projections assume maximum dividend payout only if the 25% equity ratio is maintained. Annual dividend payouts are expected to be in the range of $80-million to $172-million by 2035.

MH/NCN stated that during construction MH's debt-to-equity ratio will increase by approximately 2%. However, once the Projects are in operation, this ratio will decline, reaching approximately 7% by 2035 under the low-export-price scenario and 18% under the high-export-price scenario. These estimates assume that no incremental rate decreases are granted.

MH/NCN indicated that the Projects will have a minor effect on MH's achievement of a 75% debt-ratio target. Under the low-export-price scenario, the achievement of the debt-to-equity ratio will be delayed by two years. There will be no effect under the high-export-price scenario.

6.6.3 Impact on Interest Coverage

Interest coverage is a measure of the safety margin by which earnings before interest expense exceed period interest costs. A ratio of less than 1 indicates that the company will have to borrow money to pay its interest expense.

As a result of the Projects, MH's interest-coverage ratio is reduced slightly under the low-export-price scenario in the first few years of operations, but improves by approximately 0.15 by 2035. Under the high-export-price scenario, the Projects result in improvements in all years, with an improvement of approximately 0.45 by 2035.

6.6.4 Impact on Consumer Rates

MH/NCN stated that rates could be 4% to 8% lower than the base case. On a present-value basis discounted back to 2002, the advancement of the Projects could yield a cumulative reduction in customers' electricity bills by $87- to $216-million by 2035, depending on the export-price scenario. It should be noted that these benefits assume that the debt-to-equity ratio is held constant at 75:25.

6.6.5 Sensitivity Analysis

The sensitivity analysis that MH/NCN provided as part of the financial analysis was intended to show the degree to which the financial impacts of the proposed Wuskwatim advancement would be affected by the combination of a repetition of the worst drought on record (1987 to 1992) commencing in 2010, low export prices, and a 15% increase in base capital costs. Under this combination, MH stated that its debt-to-equity ratio would increase by no more than 2.0% over the comparable base case. The temporary increase in the debt ratio would be recovered by 2020, potentially allowing customers to benefit from rate savings totalling $75-million in 2002 dollars.

As evidenced by MH's experience during the current drought, low water conditions are more likely to be accompanied by high, rather than low, export/import prices. If high export/import prices were to occur in conjunction with a severe drought and higher capital costs, MH/NCN estimated that the potential cumulative rate benefits would rise to $179-million in 2002 dollars.

MH/NCN also completed a financial analysis that included the Projects, two times the current DSM forecast and construction of 250 MW of wind generation. MH/NCN assumed that the additional DSM would cost $740-million over the period 2003 to 2035, equating to triple the amount of utility costs required for currently planned DSM savings. In this analysis, the additional DSM is assumed not to change rates but rather to affect financial results including debt-to-equity and interest-coverage ratios.

MH/NCN stated that the temporary increases to MH's debt-to-equity ratio caused by the Projects, with two times DSM and 250 MW of wind generation, were 1.4 to 1.5%, compared to 1.6% without these assumptions. The commitment of two times DSM and 250 MW of wind generation has almost no impact on the cumulative customer-rate savings in 2002 dollars. With 250 MW of wind and two times DSM, these benefits are in the range of $79- to $217-million, compared to a range of $87- to $216-million ($2002) without these assumptions.

6.6.6 Participant Positions – Financial Analysis

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

ECS noted that the Projects do not have a significant impact on the debt ratio of MH. Provided the project is properly positioned, with the PUB exercising public oversight and support of the financial community, they are unlikely to have a negative impact on rates or the Corporation's financial integrity. Benefits do eventually accrue to ratepayers after some 10-15 years under the low-export-price scenario. Overall, rate benefits over the next 35 years will be less than 2%.

6.6.7 Presenter Positions – Financial Analysis

Some Presenters suggested that the Projects offer economic benefits to all Manitobans, particularly in the North but cautioned that they will not constitute a windfall. The benefits of the Projects can only be assured if strong oversight is continued in Manitoba. Other benefits of the Projects, such as providing local development, better training for Manitoba workers, increased investment in Manitoba, and increased tax revenues from workers, should not be ignored.

Development of hydro resources will provide major economic stimulus to the North. Large capital construction projects provide opportunity for training, skill development, employment, and business opportunities. Construction projects have a limited time span, but they play a critical role in increasing opportunity for northerners to improve their skills and employability. Upon completion of the construction phase, the legacy is a broad-based upgrading of the human-resource base and business capability in the region.

Capital development, education and training will benefit the North. While there are only a few ongoing permanent positions resulting from the Projects, these should still be considered a benefit. In addition, the Projects will provide a more stable power supply for our energy-intensive industries.

NCN and MH were encouraged to clearly and publicly announce the important benchmarks for the Projects and find an effective way to report their progress to the important stakeholders.

6.6.8 Commission Comments and Observations – Financial Analysis

The Commission accepts MH/NCN's analysis that small increases to MH's debt-to-equity ratio and the impacts to the interest-coverage ratio expected as a result of the Projects will likely have negligible impact on MH's financial stability and will not require any offsetting increase to domestic electricity rates during the start-up of the Projects. The Commission agrees that the advancement will likely help to moderate projected customer-rate increases over the long-term. However, the Commission is of the view, based on the analysis of the risks for the Projects, that the benefits to MH and its ratepayers will likely be positive, but smaller than suggested by MH/NCN. The Commission's support for the Projects is contingent on MH being able to maintain its commitment that domestic ratepayers will not experience rate increases as a result of the Projects. As recommended above, the Commission supports ongoing review by PUB of the Projects' revenues, costs, and impacts on MH's financial stability and its ratepayers as part of MH's future general rate applications.

6.7 Resource Options

6.7.1 Screening Process

MH reviews a range of resource options available on a continuous basis and studies those options that are identified as having the potential to be economically attractive and environmentally acceptable. After the initial screening of resource options is completed, a detailed study of the more attractive options assesses the incremental value that each resource could add to the system. MH indicated that benefits of the various options are considered in relation to their cost on a fully comparable and consistent basis.

While cost indicators offer many extremely useful insights in comparing resources, the indicators are limited in scope and do not capture the full range of economic, technical, and environmental issues that ultimately need to be considered before a resource is developed.

Levelized Costs

Levelized cost is the cost of the resource, expressed in dollars-per-unit-of-energy produced by the option over its useful life. Costs are based on present-value analysis using a 10% discount rate and are expressed in constant 2002 dollars. Cost estimates include all relevant costs, including capital, operating, maintenance, and fuel cost for the generating station and associated transmission costs to southern Manitoba, excluding firming and shaping costs for the wind alternatives and photovoltaics, and excluding co-generation applications. Except for the wind and photovoltaic alternatives, all the options assume a 65% capacity factor.

The levelized cost for each resource option is shown in Table 6.3. The ranges reflect uncertainty in cost estimates, site assumptions, economies of scale, and fuel forecasts.

Table 6.3 Levilized Costs

Resource Option	Levelized Cost (cents/kW.h in 2002 dollars)
Average DSM	7.2
New Hydro	7.6
Wind	10.0
CCCT	7.9
SCCT	10.3
Coal-Fired Steam	9.7
Biomass	15.0
Fuel Cells (No fuel)	20.0
Photovoltaic	32.0

From the examination of levelized costs hydropower, demand-side management (DSM), wind generation, combined-cycle combustion turbines (CCCTs), and simple-cycle combustion turbines (SCCTs) and coal-fired steam are lower-cost options. While MH stated it would continue to monitor other technologies, fuel cells, biomass, and photovoltaic technologies are not currently attractive opportunities for MH.

ENVIRONMENTAL INDICATORS

Environmental indicators such as greenhouse gases, nitrogen oxide (NOx) and sulphur dioxide (SO_2) emissions are measured on a lifecycle basis (the lifecycle includes all stages of a project, from its construction to decommissioning).

The Pembina Institute for Appropriate Development was retained by MH/NCN to provide an assessment of the greenhouse gas emissions and land changes associated with the proposed Wuskwatim project as well as six other options for electricity generation. The lifecycle land change impact of the seven projects is expressed in terms of the area of land change per unit of delivered power. Table 6.4 sets out the lifecycle GHG emissions per unit of delivered power for each electricity supply option measured in tonnes of carbon dioxide equivalences per unit of delivered power (tCO2e/GWh) as well as the lifecycle area of land change in square meters per unit of power delivered (m^2/GWh). The lifecycle analysis incorporates not only the impact from the direct operation of the facility but also the indirect impacts associated with other parts of the lifecycle such as materials, manufacturing, construction and upstream fuel extraction.

Table 6.4 Lifecycle Comparisons

Supply Option	Lifecycle GHG Emissions (tCO2e/GWh)	Lifecycle Land Change (m^2/GWh)
Wuskwatim Hydro	4	200
Pulverized Coal	1,108	31
Integrated Gasification Combined-Cycle	963	28
Biomass	68	1
Natural-Gas Simple-Cycle	837	1070
Natural-Gas Combined-Cycle	509	650
Wind	8	1

MH indicated that NOx lifecycle emissions were less than 1 tonne/GWh for the Projects and wind, which compares to coal and natural-gas options, which emit 5 tonnes/GWh and 1 tonne/GWh respectively. The SO_2 lifecycle emissions vary significantly; the Projects and wind each emit less than 1 tonne/GWh of SO_2, but coal and natural-gas options produce 32 tonnes/GWh and 15 tonnes/GWh, respectively.

6.7.2 Hydro Options

In the mid-1990s MH identified 16 sites, totalling 5,650 MW of generating capacity, in Manitoba for potential development of future hydroelectric generation stations. A large number of additional sites with a further capacity of 3,000 MW have been identified for their potential as future hydroelectric generation station sites. However, these sites are not considered to be viable within the current planning horizon, since many are small and/or remote in relation to the transmission grid. Of the 16 sites identified by MH, the Projects, Gull/Keeyask, Conawapa, and Notigi have been identified as being the most attractive options. Table 6.5 summarizes some current relevant statistics for these sites.

Currently the Projects have a higher IRR (10.3%) than Conawapa (9.0%) and Gull/Keeyask (10.1%)

The building of the Projects will have impacts on future generation options. The IRRs for Gull/Keeyask and Conawapa are marginally lower. Due to Wuskwatim occupying a portion of the transmission interconnections for export, energy from Conawapa and Gull/Keeyask may be at lower prices for off-peak periods.

Gull/Keeyask

The Gull/Keeyask project would be located on the Nelson River at Gull Rapids, which is situated in the Split Lake Resource Management Area. Gull/Keeyask requires the 500 kV Bipole III line to be constructed to transport its generated power. MH stated that it continues to assess Gull/Keeyask as a future project in conjunction with four Cree First Nations who have an interest in the project and are in proximity to the project. A framework has been developed for negotiating a project development agreement with these First Nations and progress is being made on developing a final agreement. MH is actively projecting an in-service date for Gull/Keeyask of 2012.

Fundamental principles and understandings related to the participation of the Tataskweyak Cree Nation in the Project are set out in an October 2000 agreement-in-principle. The War Lake First Nation signed a similar agreement in July 2003. The Fox Lake Cree Nation and York Factory First Nation are participating in development-agreement negotiations, although to date an AIP has not been entered into. The signed AIP is the framework guiding the negotiation of a development agreement with the First Nations related to the planning, design, construction, ownership and operation of the Gull/Keeyask Project.

Notigi

The Notigi project would involve the addition of a powerhouse with turbines to the existing Notigi Control Structure at the junction of the Rat and Burntwood rivers

Table 6.5 Proposed MH Hydroelectric Sites

Site	The Projects	Gull/ Keeyask	Notigi	Conawapa
Earliest In-Service Date	2009	2012	2014	2015
Nominal capacity (MW)	200	620	100	1250
Average Energy (GW.h/yr)	1520	4430	750	7000
In-Service Cost (Billion of Dollars)	0.9	3.3	0.7	4.3
Levelized Energy Cost (cents/kW.h in 2002 $)	6.6	7.6	8.9	6.7

in the Nelson House RMA. Notigi would be smaller and less economic than the Projects, with an earliest in-service date of 2014.

Conawapa

The Conawapa project would be located on the Nelson River, downstream of the Limestone Generating Station. Detailed engineering studies, including a fully updated cost estimate, are being conducted for Conawapa. It could conceivably be built as early as 2014, although a more likely in-service date is 2015. Conawapa also requires the construction of a 500-kV transmission line. It is unlikely that Conawapa will be constructed without a contract for its firm power. Negotiations are currently underway for a long-term power contract between MH and Ontario.

6.7.3 Natural-Gas Options

Gas turbines or combustion turbines (CTs) are widely used in the North American power industry. CTs have low capital costs, modular construction, and relatively clean emissions when compared to other fossil-fuel options. CT units are manufactured in a variety of sizes and configuration. Industry experts generally expect CT generation to comprise the vast majority of new generation well into the future.

The simple-cycle combustion turbine (SCCT) couples an electrical generator directly to the turbine shaft. SCCTs are used in MH's system during peak demand and when backup supply is needed. MH stated that for evaluation purposes, MH examined a single-unit SCCT with an average rating of 120 MW and a twin-unit option with an average rating of 240 MW.

A combined-cycle combustion turbine (CCCT) adds a second generating cycle by capturing the waste exhaust heat from the simple-cycle combustion turbine to produce steam to power a turbine. Although this is a more efficient generation process, the additional capital cost associated with the steam cycle makes this plant configuration more suitable to supply base-load operation rather than for peak times or backup supply. The CCCT option used for evaluation purposes was a single CT on a single steam turbine for a total of 250-MW average-rated capacity.

The development of the Projects does not preclude the development of SCCTs. The economics of a SCCT are improved if it is developed in combination with hydro resources. However, both the SCCT and the CCCTs have higher levelized costs and greater risk as their economics depend on the price of natural gas.

6.7.4 Coal Options

New coal-fired generation is available in several technologies and configurations. The most common commercially available configuration is traditional pulverized-coal technology (in sub-critical and supercritical designs) with downstream emission controls. In a pulverized-coal process, coal is pulverized and blown into the furnace where it is mixed with air and burned in suspension. While there are technologies for emission reduction, as yet, no commercially proven technology exists for removal of mercury and other heavy metals. New technology is in the development stage.

Coal-fired generation is subject to continuously evolving environmental regulations. Current regulations for air emissions and liquids and solids disposal can be met using available technology, but future environmental regulations may require costly technology and/or new technology.

MH stated it does not currently find

new coal generation attractive because of significantly higher capital costs relative to CTs, and future regulatory uncertainty. However, under certain circumstances, coal generation could be competitive with natural-gas CTs. These circumstances could include higher gas prices, substantial new investment in transmission from remote potential new coalfield plants, minimal carbon constraints in the future, and technology and research and development breakthroughs on emission controls. MH stated that it is considered unlikely that the cost to implement and operate these technologies will be reduced below the cost of gas-fired generation in the foreseeable future.

6.7.5 Wind Options

MH stated that it is currently planning to develop up to 250 MW of wind generation during the next ten years, providing further testing establishes that it is viable. A 250-MW wind development is estimated to cost between $400- and $500-million. Such a development could include one or more of: 1) MH solely owning the wind development, 2) MH owning the development in conjunction with another developer and/or 3) MH purchasing the wind power through power purchase agreements with non-utility generators.

MH is currently in the process of gathering data at seven different sites in southern Manitoba regarding the available wind resource. At least two other potential developers are also engaged in wind-monitoring programs in Manitoba. It is generally considered preferable to collect specific-site data for a minimum of a year prior to choosing preferred wind sites and prior to finalizing a business feasibility study for the development of wind power.

Based in part on a technical system limit of 5% maximum wind generation for the existing generation system, MH is confident that 250 MW of wind generation can be integrated into the existing system without significant technical problems. MH and others are undertaking detailed studies as to the maximum level of wind generation that can be integrated into the MAPP and the MH systems.

Another critical factor in determining the amount of wind generation targeted in the plan is the amount that wind capital costs will decline in real terms over the next 5-10 years. Some developers estimate the reduction could be as large as 30%, but there is much uncertainty in these estimates. For the purposes of the levelized cost calculation, MH assumed a 5% real reduction over the next six years.

Many uncertainties exist with respect to wind generation including factors such as:

- Economies of scale. The overall unit energy costs are lower generally for larger projects. A minimum of around 30 MW is required to obtain the majority of economies of scale.
- Wind capacity factor. The capacity factor at the better sites could be as high as around 40%, but these sites are of limited availability.
- Need for transmission upgrades. Smaller blocks of wind development (for example, less than 50 MW) are less likely to require significant transmission upgrades than larger wind developments.
- Ability of the MH system to firm the wind power. As wind is an intermittent resource, there is a technical limit to the quantity of wind power that can be firmed in any system.

- Ability of the MH to shape the wind power (for example, off-peak to on-peak, low-value month to high-value month). As wind is an intermittent resource, there is also a technical limit to the quantity of wind power that can be shaped.
- Export capability. As the Manitoba load grows there will be more room on the extra-provincial interconnection for new power and more ability for the export market to absorb new power.
- Availability of government subsidies. Currently the main subsidy available is the Canadian Federal Wind Power Production Incentive (WPPI) program subsidy. This subsidy is currently limited to 1000 MW for all of Canada and is already heavily subscribed. A minimum amount will be reserved for each province. It is unknown at this time whether the program will be expanded or what other new subsidies will become available. MH did not include WPPI in the levelized cost analysis.

The current information available to MH suggests 2009 capital costs will reduce in the order of 16% relative to the capital costs utilized by MH for a 2003 in-service date. An IRR of 9.0% is achieved for wind if a capital-cost reduction of 15% and a capacity factor of around 35% is realized subject to the operational services and transmission qualifications noted above. The IRR assumes that the federal WPPI $8/MWh incentive for wind is extended beyond its current end date and the total amount of capacity allowed for by the program would be significantly increased above the total Canadian limit of 1000 MW.

The IRRs related to wind options were also completed and are listed in the table below. The analysis assumes a 5% real reduction in capital costs from 2002 to 2009 and various levels for dependability. In MH's view, while wind is economic, it is significantly less attractive than the Projects.

Table 6.6 Wind IRRs

Wind Assumptions	IRR (Real)
250 MW, 85% dependable, 15% undependable (WPPI)	7.5%
250 MW, 70% dependable, 30% undependable (WPPI)	7.2%
250 MW, 85% dependable, 15% undependable (no WPPI)	6.5%

WPPI – Wind Power Production Incentive

Once it is assumed that 250 MW of wind has been developed in Manitoba, the cost of developing further amounts generally will be higher on a per unit basis. This situation is because the market price for regulation, firming and shaping services will likely be higher, less of these wind opportunities will remain available in Manitoba, and transmission enhancement costs will increase (especially if the additional developments are clustered in a similar region of the province, as many of the best wind resources are). The best wind sites will be sought first by developers. Thus higher levels of wind generation will tend to involve lower quality wind resources (that is, for the same turbine design, there would be a lower capacity factor) and thus higher per-unit costs.

Should wind-generation capital costs decline, increased wind-generation development is likely but will be limited. Under this scenario, MH maintains that the Projects would still remain economic. MH indicated that it has been demonstrated that even if a wind project significantly larger than the Projects were to be adopted first, it would have a very small effect on the economics of the Projects. MH added that a package of wind and DSM would not be economically more attractive than the Projects.

In addition, MH stated that many of the benefits cited by the Participants, such as shorter lead times and economies of scale, do not apply to wind in Manitoba

6.7.6 Demand-Side Management (DSM)

MH's DSM initiatives, also called Power Smart programs, include energy efficiency, conservation initiatives and load-management programs that shift demand from one period to another, allowing for more optimal use of MH system. Such initiatives enable MH to serve more domestic customers with less energy, allowing additional energy to be sold on the export market or, in the long term, to defer the domestic requirement for new generation.

MH stated that it has been actively promoting DSM since 1991 and currently offers one of the more aggressive DSM plans in North America. By the end of 2001/2002, Power Smart Programs were estimated to have achieved an annual load reduction of 496 GW.h in energy and 185 MW in winter peak demand (at generation). Future Power Smart initiatives are targeted to achieve 1,272 GW.h/year and 356 MW in savings by 2011/12. MH had not completed its 2004 Power Smart Program at the time of the hearings.

MH engaged Demand Side Energy Consultants Inc. (DSEC) to undertake a DSM potential study. DSEC identified 347 MW and 1,218 GW.h of additional potential DSM savings by the year 2011/12 under the 2000 corporate plan. MH indicated that it expected to have a revised Power Smart plan by the fall of 2004 that would incorporate some of this potential. It expected that its target would be 1.5 to 2 times greater than the targets contained in its 2001 plan.

Under MH's DSM planning process, energy-efficient opportunities are identified through various channels, including industry and other market contacts.

A detailed assessment is undertaken of opportunities that pass a high-level assessment. This requires estimating projected energy savings and projected costs associated with promoting the product, administering the program, offering incentives, training staff, training industry, monitoring, verifying savings, and performing a cost/benefit analysis.

The cost/benefit analysis is primarily based on the total-resource-cost test (TRC). TRC is the present value of marginal cost benefits divided by the present value of incremental capital investment plus present value of program administration and promotion costs. To be acceptable, opportunities must pass the TRC Test (that is, >1.0).

In addition, opportunities are assessed using a rate-impact-measure test (RIM). RIM is the present value of marginal-cost benefits divided by present value of the sum of foregone domestic revenue, program administration, promotion costs and incentive costs. Although no specific criteria are established for RIM, opportunities generally have not been pursued unless they have at least a RIM of 0.80. However, the entire portfolio should have a RIM of greater than 1.0.

MH provided evidence that the average dollars spent on DSM programs per capita in the U.S. is US$3.88, with the top ten states spending US$8.43 to US$19.48. MH spent US$3.48 per capita in 2000/01 and is projected to increase to $14.35 per capita in 2004/05. Leaders spend from 0.9 to 2.3% of electricity revenues on DSM initiatives. MH spent 1.02% of electric revenues in 2001/02 and has projected that it will spend 2.50% in 2004/05.

One of the fundamental benefits of DSM as a resource is its flexibility, since its intensity can be increased or decreased according to a region's or utility's business needs in balancing electricity supply and demand. However, since DSM is not dependable energy, there are no guarantees.

Barriers such as customer awareness, product availability, product accessibility, product affordability and market acceptance must also be taken into consideration. MH is committed to pursuing all economic DSM initiatives and is confident it has the financial and human resources to move forward with the Projects and DSM initiatives.

6.7.7 Supply-Side Enhancement Projects (SSE)

SSE projects are options that incrementally benefit the system by modifying or replacing existing equipment to enhance facility performance or to augment system operation. Improvements usually provide some combination of increased average energy, increased dependable energy or increased capacity to meet peak demands.

By 2002, approximately 140 MW of capacity and 732 GW.h of dependable energy have been gained through completed supply-side enhancements. In addition, MH has committed to additional projects amounting to 242 MW and 865 GW.h.

Included in this estimate is MH's commitment to constructing a new +/- 500 kV high-voltage direct-current (HVdc) transmission line for an in-service date of 2010. This line would proceed regardless of any new generation development and would become part of the overall Bipole III project, should it be required. The new line would provide an alternative path for power flow from the North. At peak, the line would reduce transmission losses by 86 MW based on a route east of Lake Winnipeg. The loss reduction in terms of average energy per year will be 437 GW.h.

MH has also identified other potential SSE projects that could provide up to 195 MW of capacity. MH plans to implement these potential SSE projects as opportunities arise and they are established as cost-effective.

To be selected, an SSE project's IRR must generally be equal to or greater than the economic-risk adjusted hurdle rate, similar to other resources. MH has indicated that it will pursue all economic SSEs in parallel with the Projects.

6.7.8 Non-Utility Generation (NUG)

Since 1989, MH has had a policy for purchasing electric power from independent generators wishing to sell their excess energy to MH. MH has received many inquiries from customers and independent power producers regarding their ability to sell electrical power to MH. To date, no NUGs have developed in Manitoba. MH believes that this situation is likely created by the low energy prices in Manitoba.

For less than 2 MW, MH provides a net metering approach such that if the customer generates more power than they use, the customer's meter will "run backward." The customer would be credited with the price of the last block of purchased energy, currently 5.16 cent/kW.h for residential customers.

For NUGs greater than 2 MW in capacity, MH offers a price up to the MH marginal cost based on firm export revenue, if firm transmission-line capacity is procurable, or on marginal cost based on non-firm export revenue, if non-firm transmission-line capacity is procurable. The prices are less charges that are associated with the appropriate transmission tariff, electrical losses, and marketing costs and risks.

Alternatively, a NUG in Manitoba can lease transmission-line space, and find its own wholesale customer outside Manitoba.

MH has a policy to accept non-utility generation on the MH system if certain conditions are met, including the following:

- MH will cooperate with potential NUGs to maximize the value of their generation in conjunction with the added benefit of shaping and firming supplied by the MH hydraulic generation system.
- MH will offer the NUG a price based on reselling the NUG power in the most lucrative export market incrementally available to MH, less the direct costs of shaping, firming, regulation, transmission tariff and marketing risks. MH will take no profits for the first 250MW (assuming a 35% capacity factor for wind generation) of NUG energy after which (that is, over 250MW of wind NUG) MH will review this policy.
- MH offers this NUG price as either 1) a levelized price (constant price in real dollars) or 2) a market price. A 20-year term would be offered. The levelized pricing alternatives allow NUGs to recapture their investment sooner, encouraging development and thus assisting with obtaining financing for projects.

6.7.9 Imports

MH currently has approximately 700-1200 MW of firm import capability available from the U.S., Saskatchewan and Ontario depending on ambient temperature and the status of critical transmission lines. In planning and operating the system, MH makes maximum use of this import capability, especially during drought conditions. Expansion of the import capability into Manitoba would require the construction of new transmission capability to further interconnect surrounding regions and it is difficult to obtain a willing counterpart to develop such transmission capability. Therefore, MH does not view imports as a viable alternative to the Projects.

6.7.10 Other Options

MH identified other options such as energy storage (for example, batteries), nuclear fission and nuclear fusion. However, these options are not considered to be economically viable during the planning period.

6.7.11 MH/NCN's Overall Conclusions Regarding Resource Options

MH does not find new coal generation attractive because, relative to SCCT and CCCT options fuelled by natural gas, new coal options have significantly higher capital and levelized costs, GHG, and other air emissions, and risks associated with future regulatory uncertainty. SCCTs can be attractive when installed as backup to add reliability to the system, have low capital costs, have low emissions and can be converted to CCCTs if future conditions warrant. However, natural-gas options carry with them the risk of future natural-gas price fluctuations.

DSM and SSE appear to be attractive

options both from a cost and environmental perspective. However, MH stated that the Projects will not preclude the development of these opportunities. All future DSM and SSE options will be pursued if they are determined to be economic.

Wind is an attractive option as it provides electrical energy with very low lifecycle-environmental impacts at a low cost that is expected to continue to decrease over the next 5-10 years. However, because wind power is not a firm resource, the value of the energy production from wind generation is lower than that of the Projects. MH is pursuing the development of 250 MW of wind power as well as the Projects.

The Projects are generally more attractive than a similar investment in other alternatives such as additional thermal generation or alternative energy such as solar. Such other alternatives will be pursued to the degree they are determined to be attractive, and the Projects will not likely impact moving forward with subsequent development of other hydroelectric generation projects.

MH is committed to proceed with other attractive options. MH has provided evidence that adoption of potentially attractive options, such as DSM enhancement, does not render the Projects unattractive. Conversely it has also been shown that these options would not subsequently become unattractive by the development of the Projects.

6.7.12 Participant Positions – Resource Options

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

In ECS' view, levelized costs are a reasonable measure for initial screening of options. However, for purposes of resource planning and resource advancement by MH, they should be calculated from a MH perspective, as opposed to a project perspective.

The initial screening stage should consider technical and end-use efficiency improvement, which would give added emphasis to SSE, DSM and NUG options. However, it is unlikely that these alternatives will be sufficient to exploit the export opportunity that exists prior to 2020.

Developing DSM Power Smart Programs should be a high priority for MH. Wind developments for purposes of establishing export opportunity should be limited to those undertaken by private third-party developers.

ECS stated that advancing the Projects is the preferred alternative-generation option for capitalizing on export opportunities during the period prior to 2020. However, MH/NCN's NFAAT submission does not present a comprehensive justification for the Projects. It has performed an initial screening of the options and determined that the Projects should be considered as one of the preferred alternatives. However, it has not gone through the formal process of developing alternative portfolios and then assessing them against an established set of evaluation criteria. MH/NCN identified one alternative, that being development of the Projects, and compared it to the business-as-usual case. Because this alternative showed economic benefit, MH/NCN concluded that the Projects were justified and should move forward.

MH has proposed to develop, in conjunction with the Projects, all economically feasible DSM, SSE, and alternative energy, such as wind generation. MH's approach is reasonable as long as the assumption holds that there is sufficient interconnecting transmission-line capacity, there is no competition for financial and human resources and the overall financial and rate impacts are acceptable.

The evidence that MH has provided on wind power indicates that, when compared to the Projects, SSE, and DSM, wind power is only economic under very optimistic assumptions, including significantly lower capital and operating costs than achievable at present. MH/NCN have not demonstrated that wind farms are technically and commercially viable in Manitoba.

CAC/MSOS added that lack of quality of the testimony given and information provided, with respect to DSM, cast doubt as to MH's abilities in this area.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

In Mr. Torrie's view, MH did not systematically identify and analyze alternates to the Projects. While evidence indicated that some wind power and DSM would remain economic even if the Projects proceeded, this approach is not the same as analyzing alternative scenarios for achieving the export sales revenues that MH predicts will be achieved by the Projects.

He said the utility had rejected an end-use based, market-oriented and customer-centered approach to business planning in favour of a forecast-driven, supply-oriented, project-by-project approach. The preferred project is selected first, after a superficial and qualitative screening exercise. An extremely limited range of alternatives is defined later for purposes of evaluating the already-selected preferred investment within the marketplace.

In TREE/RCM's view, the only alternatives to the Projects presented in MH's NFAAT material are the possible advancements of other hydro dams before the Projects, specifically Conawapa or Gull/Keeyask. These hydro dams are arguably not real alternatives to the Projects so much as alternative means or sequencing of the same project. MH should have taken a more thoughtful approach.

TREE/RCM stated that MH's current DSM program falls behind current best practice, and does not see it as a serious alternative. Rather than pursuing demand-side management in a true resource-acquisition mode, MH assigns it a secondary and remedial role in system planning. This approach leads to an investment strategy that pursues supply options that are demonstrably more expensive than available demand-side resources.

TREE/RCM argued that MH's consultants failed to identify all DSM technologies that are economic within the $6.15 per kilowatt-hour threshold. In addition, Mr. Torrie was of the view that the threshold should be set higher to reflect the unique benefits of DSM programs.

TREE/RCM stated that investments in DSM would capture opportunities for electricity export revenue while delivering most, if not all, the other perceived benefits of the Projects. This alternative would have lower environmental impacts, and create more jobs. Northern and First Nation employment levels achieved by the Projects could be surpassed in a DSM scenario, and lead to versatile skills that could form the basis of sustainable economic activities in northern communities. DSM technologies also provide significant competitive advantage to Manitoba business if they are able to market developed technology and processes to other regions.

Mr. Torrie pointed out that MH has indicated that:

a)MH/NCN have not identified or analyzed a program of DSM investments that would achieve the export sales revenues of the Projects.

b)No study has been completed of the potential for distributed generation in Manitoba; and MH does not have an estimate of the level of DSM investment that would be required to produce equivalent energy to the Projects or of the level of incremental DSM investment required to sustain export capability.

c) The Commission will not have the benefit of reviewing MH's updated DSM plan.

d) MH has no idea what effect the newly announced "Efficiency Manitoba" agency might have on the case for the Projects.

In TREE/RCM's view, in an ideal world, the Commission should direct MH to conduct a proper alternative analysis. However, Mr. Torrie did recognize that practical constraints may prevent that option, and recommended that, at the very least, MH be directed to file a portfolio analysis for future projects.

6.7.13 Presenter Positions – Resource Options

Many Presenters felt that enhancing other supply options, such as DSM and non-utility generation, does not appear to be a reason to forego the opportunity that the Projects can provide to all domestic ratepayers. Nonetheless, they were supportive of properly run DSM programs where benefits accrue to both the customer who participates (through lower bills) and all other ratepayers (through selling the freed-up power at higher export prices). However, it is not sensible to undertake DSM programs that increase the level of rates that need to be charged to the ratepayers.

Some Participants questioned whether MH should be taking risks on wind technology. Experienced private developers should take on the risk of price and output and MH should purchase the power at the equivalent export price it receives. It was added that MH's NUG policy for existing customers is not consistent with the arrangement being offered to wind developers and should be re-examined.

Some Participants indicated that MH should not pursue more hydroelectric projects until the issue of conservation is addressed, as Manitobans are not wise in their power usage.

6.7.14 Commission Comments and Observations – Resource Options

The Commission is of the view that a levelized-cost approach along with the use of environmental measures including greenhouse-gas emissions, SO_2 emissions, NOx emissions, and lifecycle analysis is appropriate for the initial screening process. However, the Commission believes that the level of analysis performed and submitted during the hearing for the alternatives, that were accepted by MH after initial screening as lower cost and lower environmental impact alternatives, could have been more extensive.

The Commission notes the concerns expressed by some Participants about MH's method of examining alternative approaches by indicating the impact of these alternatives on the impact of the Projects. This approach presupposes a preferred alternative and creates difficulties for the Commission and the public to evaluate all viable alternatives in an unbiased manner. The Commission believes that a portfolio analysis approach would have been more helpful and recommends that this approach be used for future projects. The portfolios should include consideration of hydroelectric sequencing, as well as implementation of other initiatives such as DSM programs and SSE projects.

Based on other supporting evidence

submitted during the hearing, the Commission is satisfied that the Projects should proceed prior to Conawapa, Gull/Keeyask and Notigi and notes that none of the Participants challenged the sequencing of hydroelectric generation. However, both DSM and SSE projects represent initiatives that may complement the Projects.

The Commission also notes the quality of MH's responses and information filed with respect to DSM. As a result, the Commission believes that information provided during the hearing to determine whether incremental DSM should proceed instead of the Projects was not conclusive. However, the Commission accepts the evidence that the Projects should proceed in conjunction with DSM initiatives. The Commission accepts MH's representation that it can increase DSM targets by 1.5 to 2 times existing targets and implement all economic SSE, as well as develop the Projects, and will expect MH to work to increase the DSM targets to greater than 2 times the current levels. The Commission cautions that MH must take care to ensure that financial, human resource or market constraints do not develop as it simultaneously undertakes DSM, SSE and the Projects.

While the Commission recognizes the environmental benefits of wind power, it has concerns about the financial viability of wind power at the present time. Significant risks impact the financial viability for this source of power including capital-cost reductions, load-factor projections, and availability of federal grants. The Commission supports MH's monitoring of wind sites, but expects that any initiative undertaken by MH to develop wind resources would have to pass the corporation's acceptable hurdle rate. The Commission also recognizes that wind development may have significantly higher risks than those of the Projects.

The Commission notes that MH has been unable to develop a NUG arrangement with existing customers in Manitoba. The Commission would recommend that MH review its NUG policy and its rate structure to ensure that all possible steps are being taken to promote economic and environmentally conscious non-utility generation.

Based on the evidence, the Commission accepts that other alternatives such as biomass and photovoltaic options are not practical alternatives at this time.

6.7.15 Commission Recommendations – Resource Options

Recommendation 6.4

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric development projects be required to employ a portfolio approach for assessing resource options. The portfolios should include consideration of hydroelectric sequencing as well as coordinated implementation of other initiatives such as DSM programs and SSE projects.

Recommendation 6.5

The Clean Environment Commission recommends that:

Manitoba Hydro should be required to review its non-utility generation policy and its rate structure to ensure that all possible steps are being taken to promote economic non-utility generation.

6.8 Summary Conclusions

The Commission believes that MH/NCN have adequately justified the Projects over the entire hearing process and is satisfied that the Projects are economic. However, significant improvements can be made with respect to the justification process for future projects through the use of alternative portfolio analysis. Comments and recommendations with respect to this process are set out in the Resource Options section of this chapter.

The Commission notes that there is no need for the Projects to be constructed with an in-service date of 2010 when domestic demand for energy is considered alone. However, the Commission recognizes that MH's mandate allows it to pursue projects to increase export sales. MH/NCN have established that an export-market opportunity exists. With this consideration of MH's mandate, the Commission accepts that there is a need for the Projects. Further comments are contained in the Export Market section of this chapter.

The Commission has considered MH's electricity-generation capability, market prospects and risks, including load growth in export jurisdictions, the energy-supply situation in the export jurisdictions and energy-pricing trends and industry restructuring. Specific comments and recommendations are contained in the Export Market section of this chapter.

The Commission has considered the SOU and is satisfied that enough information has been provided for the Commission to understand the financial analysis and the effects of the Projects to MH's financial stability and its ratepayers. However, there are a number of areas of concern with respect to the SOU, as noted in the Business Structure section of chapter. MH should seriously consider these concerns for future partnerships.

The Commission is confident that all reasonable resource options have been considered. However, the approach taken to evaluate one option against another could be improved. As discussed above, an alternative portfolio analysis would have added to the quality of information provided during the hearing and perhaps could have reduced the number of interrogatories and the cross examination of MH/NCN. As long as MH is able to double its DSM and energy conservation targets, at a minimum, and undertake all supply-side enhancement initiatives that are economic, while still pursuing the Projects, the Commission is confident that the Projects represent an economic alternative and an in-service date of 2010 should be pursued.

7. Environmental Impact Statements

7.1 Introduction

This hearing focussed on a proposal for a low-impact hydroelectric generating station and associated transmission lines. The Commission believes that adequate evidence was presented to allow it to determine that, if the appropriate mitigation and monitoring regime is put in place and the Projects are constructed and operated as proposed, the adverse effects on the biophysical, socio-economic and cultural environment will not be significant. If managed and developed in an appropriate manner, the benefits for Aboriginal people, northerners, and all Manitobans could be significant. For these reasons, the Commission is recommending the licensing of the project subject to a series of terms and licensing conditions.

The Projects are the first Manitoba hydroelectric development to be subject to a public hearing under *The Environment Act* and the first to be subject to a cooperative environmental assessment under the Canada-Manitoba Agreement on Environmental Assessment Cooperation. These are all major and positive steps forward.

This has been a learning process for each of the parties involved and represents, overall, a tremendous step forward in assessing and managing the risk to the environment that is presented by large-scale hydroelectric development in Northern Manitoba.

This is not to say the process has been perfect. In this chapter of the report, the Commission identifies areas where it believes the environmental assessment process can be improved and it has done so in straight-forward language. A later section of this chapter discusses how the process can be improved in the future. The reservations that the Commission expresses about certain elements of the EIS process must be read in light of the Commission's overall conclusion that the EIS provided the Commission with adequate information to reach a conclusion about the impacts of the Projects.

It is not possible or appropriate to simply view these Projects in isolation. They stand in the shadows of past projects and policies: the CRD, LWR, and the AFP. Furthermore, they are a herald of future projects that Manitoba Hydro is contemplating for northern Manitoba. Many Participants and Presenters to the Commission placed their concerns in this broader regional context. The Commission itself is of the view that these Projects must be seen in this broad perspective. The Wuskwatim Projects would not be viable without the previous developments and the dramatic effects they had on the North. There is now a general agreement that those projects were developed without adequate assessment of their potential socio-economic, biological and physical effects on the environment. There is a further recognition that for many northerners the effects were serious and adverse. At the start of what may turn out to be another round of intense northern hydroelectric development, the Commission recognizes its obligation to address the effects of prior development and ensure that an appropriate framework is developed for the assessment of future proposals.

For these reasons, the Commission has organized this chapter into three main sections. The first (7.2) looks at the assessment of the environmental effects associated with these Projects. The second section (7.3) looks at issues that were related to the CRD, LWR and AFP. The third section (7.4) proposes improvements to the process employed to assess these Projects.

7.2 Assessing the Projects

The discussion of the assessment of the two projects is divided into three main sub-sections:

- Previous studies and assessments
- Concepts and methodology
- EIS findings.

7.2.1 Previous Studies and Assessments

The effects of hydroelectric generation projects in northern Manitoba have been the subject of a number of earlier studies and assessments.

The Canada-Manitoba Lake Winnipeg, Churchill and Nelson Rivers (LWCNR) Study Board report (1971-75) provided extensive information on waterbodies along the lower Churchill River, Southern Indian Lake, the Rat and Burntwood rivers, and the lower Nelson River. The information included environmental conditions and anticipated effects of hydroelectric developments. The LWCNR studies addressed flow regimes, shoreline conditions and processes, lake levels, sizes and shapes, water chemistry, plankton communities and productivity, fish communities, and other related topics. For the time, LWCNR studies were state-of-the-art and comprehensive, including the existing conditions of water bodies affected by the CRD and predictions of effects likely to occur with the diversion of 30,000 cfs from the Churchill River to the Nelson River.

The 1975 LWCNR Report called for long-term ecological and socio-economic monitoring and research to protect northern residents from the adverse effects of hydroelectric developments. However, no comprehensive, formally coordinated monitoring program was put in place and, consequently, no comprehensive environmental and socio-economic assessment have been carried out. Various aquatic resource studies have been conducted since 1975 but these have been issue-driven and short-term.

DFO began a six-year study of the aquatic biology of Southern Indian Lake in 1974. In the 1980s, the study's focus was redirected to mercury contamination, leading eventually to the *Canada-Manitoba Agreement on the Study and Monitoring of Mercury in the Churchill River Diversion*. A 1987 report on mercury contamination of fish provided information on water quality along the CRD in the mid-1980s.

In 1979, the Commission of Inquiry into Manitoba Hydro (Tritschler Commission) reported on whether Manitoba Hydro carried out the intent, purpose and object of *The Manitoba Hydro Act* in all aspects of the development of the Nelson-Churchill rivers system. The Commission recommended that Manitoba Hydro should recognize the essential equivalence of the engineering, financial, socio-economic and environmental issues in the process of defining objective criteria and design parameters for its projects and programs, and retain competence in the area of environmental assessment and management.

The 1992 report of the Federal Ecological Monitoring Program (FEMP), which was established in response to a claim made under the NFA to monitor adverse effects, made a number of recommendations for future studies, including shoreline processes along the CRD to address the fate of eroded sediments. The FEMP report, which due to its limited mandate was not an environmental assessment, noted that there had not been an assessment of the effects of the CRD on the Hudson Bay estuaries. (In 1983, in response to the NFA claim, Manitoba and MH established a Program Advisory Board to manage biophysical monitoring programs.)

7.2.2 Concepts and Methodology

MH and NCN submitted environmental-impact statements for the Projects to the PAT in 2003. These statements were based on Guidelines that had been subject to a public review that included meetings convened by the Commission. Prior to the Commission's public hearing, the statements themselves were subject to technical and public review and discussion. MH/NCN argued that, since the guidelines were not prescriptive in terms of methodology, the approach taken was reasonable in relation to the nature of the Projects and the expected environmental effects. They also said that the environmental consultants retained for the EIS were professionals with many years of experience in the environmental field. MH also has professional environmental staff. NCN has Elders, resources users with substantial TSK and local knowledge, and made use of professional environmental and engineering advisers.

Before assessing the potential impact of the two Projects on the environment of northern Manitoba it is appropriate to briefly review the various concepts that are commonly used in developing such statements. The concepts to be considered are:

- Sustainable Development
- Traditional Scientific Knowledge
- Valued Environmental Components
- Baseline Conditions
- Thresholds
- Uncertainty
- Significance
- Cumulative Impact Assessment
- Environmental Protection Plans
- Consultation

7.2.2.1 Sustainable Development

The Sustainable Development Act of Manitoba defines sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

7.2.2.1.1 MH/NCN Position – Sustainable Development

The EIS documents outlined MH/NCN's commitment to the principles of sustainable development and the practice of environmental stewardship. MH's environmental-management policy recognizes that its facilities and practices affect the environment. MH stated that it operates according to its 13 sustainable-development principles in all aspects of its planning and operations.

In addition, NCN contended that it has practiced sustainable development and environmental stewardship throughout its long history in the region. The land and its resources are inextricably linked to its culture, traditional lifestyle, and economic well-being. NCN's definition of traditional knowledge includes the stewardship of the environment and Aboriginal law regarding environment.

MH/NCN stated that the Projects are consistent with Manitoba's sustainable-development principles and guidelines, providing examples of actions undertaken or proposed for the Projects that fall under these principles and guidelines. MH/NCN stated that it adheres to the principles and guidelines of sustainable development prescribed by both MH and the Government of Manitoba.

7.2.2.1.2 Participant Positions – Sustainable Development

Pimicikamak Cree Nation

PCN noted that the climate change agreement between Canada and Manitoba states that the parties recognize that hydroelectric development should be carried out in a manner that encourages sustainable development in Aboriginal communities and is respectful to environmental issues.

In this regard, MH/NCN should ensure that future environmental assessments follow best practices such as those outlined by the CEAA.

Manitoba Métis Federation

MMF said that the MH/NCN did not satisfactorily incorporate relevant sustainable-development legislation and regulations, policies, necessary approvals, land- and resource-related agreements and current planning initiatives. The MMF said Manitoba's public acceptance of the Aboriginal Justice Implementation Commission recommendation that future, major natural resource developments not proceed until agreements are reached with Aboriginal people and communities in the region constitutes a sustainable-development policy that must be considered in the preparation and review of the EIS.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

TREE/RCM said that concern for the environment and long-run sustainability generates social imperatives for energy conservation and efficiency measures and for least-impact generation options. The principles of efficient use of resources, stewardship, and global responsibility imply that MH's energy planning should be developed against a backdrop of global long-run energy scenarios that include analyses of resource availability, limits and constraints, environmental loadings and impacts, and socio-economic consequences of alternatives.

TREE/RCM recommended ensuring that the principles and guidelines of sustainability are integral to the MH mandate in resource planning and operations, and that they guide the formation of corporate and program goals, strategic planning, investments and performance measures. It further recommended that this lead to the development of long-range global energy futures and MH's role and responsibility in contributing to the more sustainable of these futures. TREE/RCM also recommended that MH address the challenge of converting ever-increasing consumption and production trends to a course that reflects the limits of renewable and non-renewable energy supplies.

7.2.2.1.3 Commission Comments and Observations – Sustainable Development

The Commission appreciates that MH/NCN are committed to the principles and guidelines of sustainable development as defined by both by MH and the Government of Manitoba. Furthermore, commitment to Manitoba's principles of stewardship, and shared responsibility and understanding is reflected in the proposed partnership arrangement between MH and NCN.

MH/NCN's commitment to the Government of Manitoba's principles of conservation, enhancement, rehabilitation and reclamation was not reflected in the EIS documents. The principles, as they relate to the Generation Project, were addressed in answers to questions submitted during the pre-hearing interrogatory process.

MH/NCN's commitment to the Government of Manitoba's global-responsibility principle depends on a reduction in greenhouse gases and other air emissions to assist the Government of Canada in fulfilling its international commitments to reduce greenhouse-gas emissions. The Commission believes that the Government of Manitoba's and MH's principle of global responsibility is compatible with the Cree worldview as presented at the hearings.

Future EIS submissions for large-scale hydroelectric developments should directly address the Government of Manitoba's *Sustainable Development Code* and its *Financial Management Guidelines*. They should also develop appropriate sustainability indicators for use in identifying and assessing environmental effects, and conducting environmental monitoring. The Commission will be making recommendations to this effect in Section 7.4 of this chapter.

7.2.2.2 Traditional Knowledge and Traditional Scientific Knowledge

7.2.2.2.1 MH/NCN Position – Traditional Knowledge

MH/NCN reported that the environmental-assessment approach adopted for the EIS included WSK and evaluation of environmental-effects and socio-economic analysis, along with TSK, local knowledge, and other public and interest-group perspectives. It was explained that local knowledge and TSK were an essential part of the planning and assessment process for the Projects. MH/NCN provided examples where traditional knowledge was applied to the design, construction and operation of the Projects, including the low-head dam, small forebay area, modified run-of-the-river operation and access-road alignment for the Generation Project, and selection of rights-of-way for the Transmission Project. Elvis Thomas, NCN Future Development, said that, *"A landmark of the Environmental Impact Assessment process for Wuskwatim has been the use of local and traditional knowledge for the first time in assessing the impact of a hydroelectric generating and transmission project in Manitoba. This information is in addition to the scientific information that is usually at the core of the environmental impact statements."*

MH/NCN reported that NCN members shared TSK about the local area through a variety of mechanisms. These included collaboration between scientists and NCN members in field programs, a full-scale opinion survey of members and field trips by NCN Elders. In addition, NCN developed its own TSK study that included interviews with resource harvesters, Elders and others. A committee of community representatives guided the interview process and established principles and guidelines on how TSK should be collected and used. A resource harvest calendar was also designed for use by NCN members to record harvest statistics.

MH/NCN explained that TSK formed an integral part of the assessment conducted for the Projects. Along with other sources of information, TSK was used to identify, assess and mitigate adverse effects. It was used in the selection of alternatives, siting of infrastructure and interpretation of the importance of effects. MH/NCN also noted that differences in the interpretation of information obtained from TSK and WSK were noted throughout the EIS or during the hearings. In these cases MH/NCN indicated that follow-up was proposed to address matters in environmental protection plans.

The NCN community consultants commented that they participated in joint NCN/MH committee meetings, offered their own TSK, and helped collect information from others about sacred sites, use of the land and understanding of the environment near each of the alternative routes. The consultants undertook a formal process of interviewing Elders and resource harvesters about their TSK of the RMA and recording the information on tape, on maps and in writing.

7.2.2.2.2 Participant Positions – Traditional Knowledge

Community Association of South Indian Lake

CASIL requested that MH/NCN fulfill its obligations to CASIL and its members for meaningful public participation in the EIS, including the cumulative-effects assessment. CASIL also requested that MH/NCN document their concerns, utilize their TSK, and demonstrate how MH/NCN will mitigate any residual social, cultural, economic, environmental and spiritual effects. CASIL questioned whether there were protocols or data-sharing agreements with MH or their consultants for TSK to be provided in a protected way.

Displaced Residents of South Indian Lake

DRSIL questioned how MH/NCN can say that the EIS incorporated TSK, when all the Elders strongly voiced their opposition to the Projects at a recent meeting in Nelson House.

Manitoba Métis Federation

While the MMF did not specifically address TSK, the Federation did state that the Métis have a distinct culture, way of life and economy that necessitates separate and full consultation to determine the ways that the Métis will be affected by the Projects. Reference was made to the Métis use of plants that is separate and distinct from the use by First Nations.

7.2.2.2.3 Presenters Positions – Traditional Knowledge

Mr. D'Arcy Linklater, NCN Councillor, spoke about traditional knowledge, partnerships, hydropower and treaty land entitlement, and the path to the future. He noted that *"traditional knowledge"* is actually *"traditional science"* and should not be placed on another level that suggests it is of lesser importance or usefulness. Mr. Linklater commented that NCN has continued to document the traditional knowledge of their Elders and community members, which supports community and strategic planning. He noted that the community is fortunate that their ancestors established traditional territories over a rich and varied landscape. Mr. Linklater went on to explain that the NCN leaders recognize present and future opportunities that will be built upon the knowledge and wisdom of the community. In applying this knowledge it is believed that NCN has something called *"Indian science"* which is a pool of wisdom that exists in the community and beyond in other communities.

Chief Robert Wavey, from Fox Lake Cree Nation, commented that any alteration of the ecosystem is an alteration to the blueprint of traditional knowledge and pursuits, no matter how minor or irrelevant the alteration may seem to be. Chief Wavey explained that when the environment is altered there is a natural response to the landscape and the wildlife. He went on to describe how this response has to be relearned, if possible, by the hunters, fishers and trappers of the area. FLCN members continue to experience the consequences of development that paid no attention to the environment. Aboriginal TSK and approaches to environmental protection must be applied to ensure that future development does not destroy the land and waters that have sustained life for thousands of years.

Grand Chief Dr. Sydney Garrioch, of Manitoba Keewatinook Ininew Okimowin (MKO), acknowledged NCN's efforts to incorporate TSK and to ensure the involvement of NCN citizens in project training and in the assessment of potential adverse environmental effects.

Mr. Victor Spence, Manager of Future Development for TCN, remarked that participation in the planning process with MH and Cree Nations for the proposed Gull/Keeyask generation station has provided an opportunity to further develop and focus the community-based decision process. Mr. Spence explained that TCN members make their own decisions based on individual and collective TSK about the waters, and on understandings, based on first-hand experience, about the effects of large developments on culture, values, beliefs, traditions and customs. Because TCN knows and values the importance of TSK held by Elders and resources, a comprehensive consultation process has been developed called OWL – Overview of Water and Land. OWL enables TCN to evaluate Gull/Keeyask in a way that is consistent with the Cree worldview. It provides TCN members with opportunity to judge the merits of Gull/Keeyask based on the best engineering and economic information and most importantly on Cree traditional knowledge. Both TSK and WSK are of equal weight and importance in making decisions about Gull/Keeyask.

7.2.2.2.4 Commission Comments and Observations – Traditional Knowledge

The Commission appreciates that TSK contributed to decisions by MH/NCN in the design and future construction and operation of the Projects. It is noted that the 1996 NFA Implementation Agreement and the proposed partnership arrangement may have served to facilitate this. The Commission also acknowledges that TSK was practiced in the identification of burial locations, sacred sites, ceremonial areas, as well as the selection of appropriate mitigation and that TSK will be used in environmental protection plans. However, except for the general references that TSK was used, use of traditional knowledge did not appear to be as evident in the EIS documents for the identification, assessment and mitigation of environmental effects. On this matter, the Commission accepts MH/NCN's explanation that, while TSK was used in the environmental assessments, its use was not effectively communicated in the EIS documents.

7.2.2.3 Valued Environmental Components

Valued Environmental Components (VEC) can be any part of the environment considered important in the assessment process. Importance may be determined on the basis of cultural values or scientific concern. VECs can focus the analysis on important aspects of the biophysical, socio-economic and cultural environment, particularly for the assessment of cumulative environmental effects.

7.2.2.3.1 MH/NCN Position – Valued Environmental Components

MH/NCN stated in the EIS documents that the assessment approach for the

Generation Project generally focused on VECs to address issues and concerns. Although not always explicitly presented as a VEC-based approach, the result was determined to be a characterization of potential effects in the context of both scientifically based ecosystem concerns and local and traditional environmental values. MH/NCN explained that the EIS documents included TSK that is based on the Cree worldview.

MH/NCN identified VECs separately where appropriate in each section of the Generation Project EIS but did not use a VEC-based approach for the Transmission Project. VECs were selected because they met the following criteria: 1) particular importance to humans, 2) species representation, 3) environmental indicators, 4) rare or endangered, or 5) special ecological significance.

MH/NCN submitted that the EIS documents satisfy the requirements of the EIS Guidelines and are consistent with current environmental assessment practice. It was stated that VECs were selected in consultation with NCN Elders and resource harvesters during scoping and were used appropriately in the EIS. While VECs were not selected for some areas of study, such as fish habitat for the Generation Project and woodland caribou for the Transmission Project, MH/NCN contended that these environmental components were treated as if they were VECs.

7.2.2.3.2 Participant Positions – Valued Environmental Components

Canadian Nature Federation

CNF expressed concerns about the selective use of VECs for the Generation Project, pointing to the failure to use woodland caribou as a VEC in the assessment of the Transmission Project.

Community Association of South Indian Lake

CASIL argued that many extremely significant aspects of the environment were excluded from the EIS. In particular, they said that omitting biodiversity in an environmental assessment is an unacceptable practice. CASIL said that rather than using the most logical VECs, the EIS looked at bits and pieces. They questioned why water as fish habitat, key indicator fish species for the ecosystem health of Wuskwatim Lake, other species in the food chain, and other species that inhabit the water were not considered as VECs.

7.2.2.3.3 Commission Comments and Observations – Valued Environmental Components

While the EIS Guidelines for both Projects pointed to the use of VECs in evaluating significance, environmental components such as fish habitat, social values and cultural values were not selected. Furthermore VECs were not used for the Transmission Project. While the decision not to use a full range of VECs increased the difficulty in identifying and assessing the Projects' effects, this may have been partially compensated for by the use of both TSK and WSK, and standard environmental assessment methods.

The Commission also appreciates the Cree worldview and the holistic perspective on the environment. In this regard, the Commission believes that both TSK and WSK approaches to environmental assessment are valid and warrant consideration when identifying and assessing environmental effects.

At a general level, ecosystem health is important but it is difficult to measure and monitor without environmental indicators such as VECs. Consequently, the Commission believes that TSK and WSK approaches that include the balanced use of VECs, where appropriate, to be good environmental assessment practice and will be recommending their use in Project-related EPPs.

7.2.2.4 Baseline Conditions

Baseline conditions are characteristics of the biophysical, socio-economic and cultural environment that would exist without the proposed project in place. Environmental characteristics tend to be variable due to natural and human-caused factors that are demonstrated by trends, cycles and abrupt changes. Consequently, baseline conditions are dynamic and continually change over time, resulting in a requirement for ongoing monitoring.

7.2.2.4.1 MH/NCN Position – Baseline Conditions

MH/NCN described the baseline environment in the EIS as *"the existing or baseline environment as it was expected to evolve in the future if the Projects were not to occur."* For the purpose of their assessment, *"the currently regulated condition under the CRD interim licence and the AFP annual variances was taken to be the baseline condition."* MH/NCN expects the CRD to *"continue to operate with Wuskwatim as it operates under current rules and regulations."* In order to determine the long-term dependable flow for the Generation Project, MH/NCN developed a simulated long-term average annual project inflow for an 86-year period. From this it was estimated that the long-term average annual inflow would be approximately 100 m^3/s higher than the average post CRD inflows. This higher long-term project inflow is used by MH/NCN in both the design and the environmental impact assessment of the Project.

MH/NCN said that the assessment approach recognized that Wuskwatim Lake and adjoining waters, as well as the entire CRD, is a disrupted environment as a result of the initial diversion of water from the Churchill River in the 1970s and ongoing regulation under the AFP. For the purposes of assessing the effects of the Generation Project, this regulated environment was considered to be the baseline. Because the diversion route and its headwater reservoir on Southern Indian Lake are still adjusting to the initial disruption caused by the CRD/AFP, MH/NCN refer to an evolving baseline for the EIS.

The EIS considered the baseline as the current condition, defined as the environment over the past 5 to 10 years and noted that various agencies completed studies along the Churchill, Burntwood and Nelson rivers prior to and after the CRD. Such historic information was used in the EIS where considered relevant and referenced in the literature cited sections. NCN members, including Elders and resource harvesters, contributed their TSK to the description of baseline conditions.

7.2.2.4.2 Commission Comments and Observations – Baseline Conditions

The Commission acknowledges MH/NCN's concept of an evolving baseline for environmental assessments of the Projects due to natural changes or trends and the continuing effects of the CRD/AFP and associated developments. It is understood that baseline conditions have evolved from pre-CRD conditions to the present and will continue to evolve over time. The Commission also appreciates that the Projects and other existing and proposed projects and activities will modify these conditions over time.

The Commission appreciates the MH/NCN statement that they have included both WSK and TSK throughout the EIS documents to describe baseline conditions for the Projects.

However, this use is not well documented in the EIS documents.

The information MH/NCN provided on the Generation Project's effects on mercury levels in fish showed the value of pre-CRD information, established over a larger geographic area. However, this approach did not appear to be used for all VECs or critical parameters. The Commission's licensing recommendations in Section 7.4 proposes the use of a broader baseline approach in future developments.

7.2.2.5 Thresholds

A threshold is a limit or tolerance for a VEC that likely results in a measurable or demonstrable effect if it is exceeded. Examples where thresholds are applied include water-quality criteria, contaminant levels in fish, acute-toxicity response, animal-population collapse, and wilderness expectations. Thresholds may be established from the literature, legal standards, WSK, TSK and public consultation.

7.2.2.5.1 MH/NCN Position - Thresholds

MH/NCN said that the EIS addressed issues related to thresholds separately for each Project as required for each environmental component. They contended that the extent to which existing environmental components are vulnerable due to past projects, protected status or other factors, or may be made vulnerable in the future due to interactions with existing and future developments, was fully considered. MH/NCN viewed thresholds to be important for follow-up monitoring of Project effects.

7.2.2.5.2 Participants Positions - Thresholds

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

CAC/MSOS said that MH/NCN made only general reference to the actual thresholds. Given the difficulty in determining thresholds for VECs, it may have been wise to start developing acceptable thresholds for resource development and change in northern Manitoba.

7.2.2.5.3 Commission Comments and Observations - Thresholds

The Commission considers the use of thresholds to be important for environmental assessments of major projects such as Wuskwatim. Thresholds provide a means to assess the adversity of potential environmental effects and to evaluate the significance of residual effects. Given the nature and extent of the studies undertaken, thresholds should have been readily identified for VECs.

Apart from water-quality parameters and mercury levels in fish, the Commission observed that there appears to be very limited information in the EIS documents to demonstrate whether environmental effects of the Projects are below, at or above thresholds. Consequently, it is difficult to determine whether the residual environmental effects of the projects are significant in relations to thresholds. In the absence of thresholds or other measurable parameters, the significance evaluation criteria defined by the EIS Guidelines must be relied upon in assessing environmental impacts.

7.2.2.6 Uncertainty

Uncertainty is inherent in environmental assessment. Since it not possible to predict the future with a high degree of confidence, various tools are used in environmental assessment to improve predictions and reduce uncertainty. The precautionary principle is typically applied to take preventative action to avoid harm before scientific certainty has been established. This principle holds that whenever there is reasonable suspicion of harm, lack of scientific certainty should not be used as an excuse to preclude preventative action. Follow-up monitoring provides for continual improvement in environmental-assessment practice, leading to improved certainty.

7.2.2.6.1 MH/NCN Position - Uncertainty

MH/NCN did not specifically address uncertainty in its approach to the assessment of the environmental effects of the Projects. However, it was noted that climate change may have an effect on the environment and this effect is addressed to the extent possible, given the high degree of uncertainty with respect to predicting climate change and the effects of climate change on the projects. Scientific uncertainty was a factor used to determine the likelihood of significance of residual effects.

MH/NCN said that EIS predictions are based on the best available information at the time the assessment was completed. It acknowledged that, given the complexity of the systems being studied, there is inherent uncertainty in the predictions. Areas of potential uncertainty were climate change, riverine erosion and lake sedimentation. MH/NCN said that it is unlikely that uncertainty will change the identification of environmental effects, but there is potential that uncertainty could affect the magnitude of the effects.

In addressing this uncertainty, MH/NCN retained a team of experienced professionals from a number of consulting companies. In addition, MH has senior environmental specialists with previous experience with similar projects and NCN has Elders and resource managers with extensive TSK of the area.

MH/NCN concluded that in the case of the Projects, the future is not fraught with uncertainty.

7.2.2.6.2 Participant Positions – Uncertainty

Consumers Association of Canada/Manitoba Society of Seniors Inc.

CAC/MSOS commented that there are two layers of uncertainty that may undermine confidence in the EIS. First, there are the uncertainties that are an integral part of the process of prediction. These can be controlled or mitigated but never eliminated. Second, the process is mired in its own peculiar blend of uncertainty that stems from the environment being assessed as well as the process of assessing that environment.

7.2.2.6.3 Commission Comments and Observations – Uncertainty

MH/NCN produced high-quality tabular and graphic projections of energy production, load growth and exports for the NFAAT filing. These materials facilitated discussion and resulted in improved understanding by all parties. However, no similar predictions were provided in the EIS documents. It is believed that the use of similar graphic projections for the EIS would have helped to explain the cumulative environmental effects of the Projects and the effects of future projects and activities.

The Commission is concerned about the apparent uncertainty associated with identifying and quantifying environmental effects and residual environmental effects. For example, it was noted that residual effects were generally not expressed in quantitative terms, which implies wide confidence limits. The Commission is also concerned that there was apparent uncertainty in evaluating the significance of residual environmental effects. Increased use of TSK in support of WSK would serve to reduce uncertainty in areas where NCN Elders and resource users have experience.

Because of the limitations in the quantitative environmental analysis in the EIS documents, the Commission is concerned that there is uncertainty about potential costs of mitigation, remediation and compensation. The levels of uncertainty call for a vigourous application of the precautionary principle to ensure that adverse effects are mitigated and residual effects are minimized.

7.2.2.7 Significance

Significance is a measure of how adverse or beneficial an effect may be on a VEC. It is a value judgment based on the attributes of a residual environmental effect that is determined by the application of a suitable significance evaluation framework. Typically, a proposed project should not proceed if the residual adverse effects are determined in an environmental assessment to be significant and not justified for the particular situation.

7.2.2.7.1 MH/NCN Position – Significance

The EIS documents describe the process used in determining the significance of residual or net environmental effects of the Projects after the application of mitigation measures. The process is in general agreement with that set out in the Guidelines, and included both direct and indirect biophysical and socio-economic effects. The assessment approach in each of the EIS documents described both beneficial and adverse environmental effects where applicable.

Residual environmental effects were first assessed to determine whether or not they were significant and then evaluated in terms of their likelihood of significance. A determination was then made as to whether or not there was a likely significant residual adverse effect. MH/NCN stated that both TSK and WSK were used in the environmental assessment approach including the evaluation of significance. For example, an NCN member related how, while the community consultants would speak about a low-head dam and 0.5 km^2 of flooding, Elders would include cultural questions such the fishing and hunting practices of past and future generations in their valuation of significance.

7.2.2.7.2 Participant Positions – Significance

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

CAC/MSOS commented that, despite the accumulation of data and the qualifications of the environmental practitioners, predicting what will happen to the environment is inherently uncertain. They also noted that, while MH/NCN predicts that the Projects will have no significant adverse effects on the region, there always remains an element of uncertainty in the process.

CAC/MSOS noted that many VECs do not have regulatory, ecological or other thresholds, and in the absence of such measures, significance was determined largely by professional judgment.

Community Association of South Indian Lake

CASIL criticized the MH/NCN approach in determining significance of residual effects. They submitted that *"deeming all effects insignificant to ensure project approval by the regulators and a comfort level among the uninformed public makes a mockery of environmental assessment especially* *when objective criteria and quantitative analysis is not offered."* CASIL further stated that, *"adjusting the assessment of significance to meet the needs of MH/NCN is unbelievable and disregards the intent of environmental assessments to support sustainable development."* They did not accept that exceeding guideline levels for TSS in Wuskwatim Lake and the permanent loss of Taskinigup Falls were insignificant.

CASIL concluded that the EIS for the Generation Project was inadequate and inconsistent with best practices for environmental assessment, public involvement, Aboriginal consultation and cumulative-effects assessment. They requested that the Commission recommend that the determination of significance be revisited. CASIL argued that, since CASIL lands are within the study area, they should have been involved in the definition and determination of significance.

7.2.2.7.3 Commission Comments and Observations – Significance

The Commission observed that the EIS documents generally reflect the Guideline requirements for significance evaluation. However, it notes that Guidelines required *"credible analysis and documentation in support of all the conclusions of no or insignificant effects."* The Commission is concerned that the EIS documents do not provide such analysis and documentation in all cases to support conclusions of insignificance. Statement of residual effects in quantitative terms using the same units of measure as the evaluation criteria would have served to address this concern.

The Commission accepts that MH/NCN used WSK and TSK in the environmental assessment of the Projects but it did not see evidence that TSK was used in the actual evaluation of significance. For example, the criteria used in the EIS evaluation did not include TSK values and beliefs.

The Commission also observed that effective use does not appear to have been made of existing thresholds provided by legislation, policy and the scientific literature. Exceeding thresholds is an important consideration in the evaluation of significance in terms of regulatory compliance, human health and safety, ecological breaking points and limits of public acceptance, such as sacred site use and wilderness criteria. The Commission believes that in the absence of thresholds, the sort of mitigation, monitoring and reporting regime associated with the precautionary principle should be applied until thresholds are established for VECs.

7.2.2.8 Cumulative Environmental Effects

Cumulative-environmental-effects analysis measures changes in the environment that are caused by an action in combination with the effects of other past, present and future human actions. The EIS guidelines required MH/NCN to conduct a cumulative-effects assessment as an integral part of the environmental and socio-economic assessment.

7.2.2.8.1 MH/NCN Position – Cumulative Environmental Effects

MH/NCN said that the cumulative-effects-assessment framework used for the Projects was based on the approach prescribed in the CEAA's *Cumulative Effects Assessment Practitioners Guide*. Cumulative effects for the Generation Project were dealt with separately in each section of the EIS (that is, aquatic environment, terrestrial environment) while the Transmission Project dealt with cumulative effects in the Environmental and Socio-economic Impacts and Mitigation section.

In both EIS documents, MH/NCN determined the cumulative effects of the Projects to be insignificant.

MH/NCN considered the environmental effects of past projects and activities including those of the CRD, AFP, generating stations and transmission facilities to be part of the baseline conditions for the Projects. Future projects considered by MH/NCN included the present Projects and projects planned by MH in the Project study area over the next five to ten years. Gull/Keeyask, Conawapa, Bipole III and other future generation and transmission projects were therefore excluded from the cumulative-effects assessment. As a result, the cumulative-effects-assessment study area was essentially the same as that for the Projects' assessments.

MH/NCN maintained that the cumulative-effects-assessment requirements outlined in the EIS Guidelines were fulfilled and that the assessment carried out for the Projects was consistent with best practice as defined by the CEAA.

7.2.2.8.2 Participant Positions – Cumulative Environmental Effects

Boreal Forest Network

BFN recommended that the Commission consider system-wide impacts of hydroelectric development since there is more than one dam on the Churchill-Nelson rivers system. For this reason, they stated that a cumulative-effects assessment is required.

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

CAC/MSOS said that the cumulative-effects-assessment methodology relied upon by MH/NCN should be rigorously tested and regularly reviewed by an independent monitoring authority. They recommended regular reporting on both the adequacy of the methodology chosen and the incidence of cumulative effects, mitigation measures required and success of mitigation. CAC/MSOS suggested that MH/NCN's cumulative-effects-assessment expert be requested to report on the cumulative-effects-assessment process.

CAC/MSOS said that large-scale land-use planning for the region should be considered since it is likely to witness more resource development. CAC/MSOS determined that a land-use plan incorporating the concerns and advice of many stakeholders might help to control the nature and extent of environmental change.

CAC/MSOS concluded that, since a proper environmental assessment has never been conducted on the CRD, it would have been prudent to include the CRD as part of the cumulative-effects assessment for the Projects. The decision not to include the CRD should have been reviewed by an independent expert and such a review should have been publicly tested.

Community Association of South Indian Lake

CASIL said that the baseline conditions for the Generation Project were inappropriate, since they excluded effects of other projects such as the CRD and AFP. As a result, the approach to cumulative-effects assessment was flawed, mitigation opportunities were missed and uncertainty is associated with the determination of significance.

CASIL said that the effects of the Generation Project on water quality should be used to define the geographic scope of the cumulative-effects assessment. They noted that ongoing erosion on Southern Indian Lake contributes sediments to Wuskwatim Lake and that increased erosion from construction and operation of the Generation Project will add to the sediment load in the lake. CASIL went on to argue that the determination of significance of increased suspended solids was arbitrary and did not recognize that the Government of Manitoba's water-quality guidelines would be exceeded.

CASIL expressed no confidence in the cumulative-effects assessment of the Generation Project, contending that the overall approach to the EIS is flawed.

CASIL concluded that the EIS for the Generation Project was inadequate and inconsistent with best practices for cumulative-effects assessment. They asked the Commission to recommend that a meaningful cumulative-effects assessment be completed and subjected to peer review before Project approval. They also recommended that the assessment properly review the Project's effects in combination with the effects of existing and future projects, and that the assessment be done for a regional study area.

Pimicikamak Cree Nation

PCN submitted that many, if not most, Project impacts would be felt more at Cross Lake than anywhere else, including NCN territory. They contended that it is not possible to conclude that the Projects will have no material effects without a cumulative-effects assessment of the entire system. PCN acknowledged that, while it may be difficult to assess cumulative effects, there is no reason not to do so when cumulative effects are important to the analysis of a development that will be added to, and alter, one large integrated complex.

7.2.2.8.3 Commission Comments and Observations – Cumulative Environmental Effects

The Commission appreciated the debate between MH/NCN and the Participants on the adequacy of the cumulative-effects assessment. The debate centred around whether past projects and activities should be included in the baseline, whether the impacts of contemplated developments should be considered, the extent to which VECs were used, and the measurement of residual effects.

The Commission observes that MH/NCN's definition of cumulative environmental assessment is consistent with the CEAA *Practitioners Guide* and the EIS Guidelines. Furthermore, the Generation Project EIS outlines a logical cumulative-effects assessment framework. It was noted that the framework was based on two scoping workshops that involved MH, NCN, the environmental management team and an external expert. However, it appears to the Commission that MH/NCN chose to interpret and implement the definition of cumulative effects narrowly.

Examples of this interpretation include:

- the decision not to extend cumulative-effects assessment beyond the assessment area used for the Projects' effects
- the decision not to extend the cumulative-effects assessment beyond a ten-year period
- the decision not to use any VECs for the Transmission Project and not to use such VECs as fish habitat and woodland caribou for the Generation Project
- the decision not to extend the study of sediments to the Nelson River estuary
- the inclusion of the effects of CRD and AFP in the Projects' baseline
- lack of consideration to regional indirect effects.

Also, it appears that TSK was not a major component of the cumulative-effects assessment despite being integral to the assessments of the Projects.

The Commission heard considerable

evidence that the CRD devastated the aquatic environment in a large region of northern Manitoba, resulting in significant adverse socio-economic and cultural effects on First Nations and others. The Commission further noted that the CRD and AFP and others have not been subject to environmental assessments in accordance with current standards. Consequently, environmental effects of past project activities have not been assessed and it is generally not known whether these effects are increasing, decreasing or staying the same due to limited environmental monitoring. The Commission further notes that the effects of the Projects appear to be relatively small or undetectable in relation to those of the CRD/AFP, and that the effects may be masked by those that already exist due to the extensive geographic area and large magnitude of the overall impact.

However, the Commission recognizes that the EIS documents under review represent the first environmental assessments conducted by MH on hydroelectric developments under *The Environment Act* and the CMAEAC. The Commission is also aware that cumulative-effects assessment is not a requirement under Manitoba's environmental legislation. The Commission therefore concludes that, according to Manitoba's current environmental assessment standards, MH/NCN made a reasonable cumulative-effects assessment. There is substantial room for improvement in relation to national and international environmental assessment standards. These concerns will be addressed in Section 7.4 of this chapter.

7.2.2.9 Environmental Protection Plans

An environmental protection plan is a plan to implement mitigation measures, monitoring, regulatory requirements, licence terms and conditions, public commitments, and other matters, and includes responsibilities and reporting protocols. Such plans play an important role in identifying and mitigating adverse impacts, determining the accuracy of predictions in EIS documents, and establishing public accountability.

7.2.2.9.1 MH/NCN Position – Environmental Protection Plans and Environmental Monitoring

MH/NCN committed to three environmental protection plans for the Generation Project (one for the Generation Station, one for the Construction Camp, and one for the Access Road) and to three more plans for the Transmission Project (one for the Wuskwatim to Birchtree transmission line, one for the Wuskwatim to Herblet Lake Station transmission line and one for the Herblet Lake Station to Rall's Island Station transmission line) prior to the commencement of construction. These plans would provide environmental protection guidelines to supplement licence/approval conditions, project design, construction and operating specifications to prevent or minimize adverse environmental effects during construction and operation of the Projects.

Such plans would be user-friendly instructional reference documents prepared for field construction and operating personnel. They would be prepared in consultation with Elders and resource users. NCN members would participate in their implementation. MH/NCN noted that the plans would be presented in a format that provided the user with a quick reference and instruction regarding anticipated concerns and also described procedures for dealing with unanticipated situations.

These plans would form part of MH/NCN's environmental-monitoring process and MH/NCN proposed that they be incorporated into any *Environment Act* licence for the project.

MH/NCN submitted that no credible evidence has been submitted demonstrating that existing monitoring programs have failed. MH/NCN recommended that there be continued incorporation of TSK and WSK through the Project construction and post-construction periods and supported ongoing monitoring and research within the RMA.

MH/NCN defined environmental monitoring as *"measuring the state of the environment after a project is implemented to see if anticipated impacts have actually occurred and how mitigation measures have been applied."* Examples of long-term monitoring programs include those for Cross Lake, Southern Indian Lake and Churchill. It was noted that all of these programs involved hiring community members and use of scientific and traditional knowledge. MH/NCN said monitoring means retaining consultants trained in the field with broad experience to do the monitoring. MH/NCN said communities are involved in monitoring programs and reports are submitted to the regulators, who in turn ensure that the monitoring and licence requirements are fulfilled.

In response to the question of whether or not an independent monitoring agency is required for the projects, MH/NCN stated that, while such agencies are not common, their role is often to review work that is conducted by the proponent and to provide comments to the regulators and the public. In the Manitoba case, MH/NCN said that Manitoba Conservation fulfills the role of arm's-length monitor. Given that NCN already has a management board, MH/NCN questioned the practicality of putting yet another review process in place. MH/NCN further cautioned against requiring another review of the activities of a people who say that they want to manage their own resources the best way they know how.

7.2.2.9.2 Participant Positions – Environmental Protection Plans and Monitoring

Boreal Forest Network

BFN called on the Commission to recommend establishment of a separate and independent body to monitor MH in terms of its fiduciary obligations under the NFA and the NFA Master Implementation Agreement. BFN noted that Projects benefits must include enhanced understanding of the effects of such developments on sensitive species like woodland caribou.

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

CAC/MSOS recommended that the independent monitoring agency model used in the Northwest Territories should be investigated to determine whether it could be adapted to developments in Manitoba's northern boreal forest. Such a monitoring agency could review the design of monitoring programs, examine the results of ongoing programs to assess their effectiveness, and prepare public reports on monitoring programs.

Canadian Nature Federation

CNF said that MH/NCN had deferred attention to important and or substantive environmental issues to the environmental protection plans. CNF recommended that, before any licence is granted to MH/NCN, it either provide the environmental protection plans for public review or publicly answer all EIS-related questions raised during the hearing and pre-hearing process that had been deferred to the environmental protection plans.

Community Association of South Indian Lake

CASIL recommended community involvement in compliance monitoring with

The Environment Act and *The Water Power Act* licence terms and conditions, and in environmental monitoring for the CRD and Generation Project. They also recommended CASIL's involvement in the creation and implementation of a systematic and documented follow-up monitoring program.

A report prepared for CASIL recommended that a monitoring program be set up to study environmental parameters such as aquatic species, furbearing animals, shoreline and debris dynamics, and winter transportation guidelines.

Trap Line No. 18

Trap Line No. 18, represented by Mr. Greg McIvor and Mr. Don McIvor, requested that the Commission recommend the establishment of a joint management process that would include water quality, wildlife, hydrological, environmental and climate change monitoring.

7.2.2.9.3 Commission Comments and Observations – Environmental Protection Plans and Monitoring

During the public hearings the Commission was told that the Cree understanding of monitoring includes a responsibility to mitigate. The fact that monitoring and mitigation are joint elements in the proposed environmental protection plans is a positive reflection of this understanding. Mitigation and monitoring are essential to determine the effects of the projects, to assess the accuracy of the EIS process, and to maintain public credibility for MH/NCN. It is an essential element in rebuilding and maintaining trust between the various communities and partners affected by this project. The viability of future MH projects in the North depends on the presence of such trust.

The Commission recognizes that MH/NCN have committed to an ambitious environmental-monitoring program. The Commission would like to see the scope of the environmental protection plans expanded to assess the adequacy of the environmental assessment, evaluate the effectiveness of mitigation measures, document baseline conditions and determine thresholds for VECs.

Ongoing environmental monitoring has been and will continue to be carried out in the region. Additional monitoring will be required as part of other approvals such as *Fisheries Act* authorizations. The Commission is concerned that there may be duplication of effort and believes that there is an opportunity to coordinate monitoring activities and make them more effective and less costly.

The Commission therefore encourages Manitoba to take a lead role in the coordination of all monitoring requirements resulting from the Projects and not just those outlined in environmental protection plans. The Manitoba Department of Water Stewardship should be provided with the necessary staff and financial resources to support expanded water-related monitoring programs.

The Commission believes that implementation of environmental protection plans provides an opportunity for First Nations and other Aboriginal organizations to take on additional environmental responsibilities in northern Manitoba. The scope of monitoring programs will be broadened when follow-up from other past, present and future developments is taken into account. Use of northern Aboriginal-based companies would provide for employment of Aboriginal people and northern residents. It would also provide for the effective use of both TSK and WSK in monitoring programs.

The Commission understands the concerns

that several Participants expressed about MH's ability to conduct environmental monitoring and reporting. An independent northern-based monitoring agency or board with strong community representation and ongoing responsibility for sustainable development would be able to balance and adjust to aspirations and rights of multiple resource users and stakeholders. While the Commission is not making a recommendation on this point, it urges Manitoba Conservation to consider such an initiative.

The Commission also noted that several Participants expressed concern regarding public review of the environmental protection plans and accountability for their implementation. It is therefore suggested that the Government of Manitoba provide an opportunity for the public to review draft environmental protection plans prior to approval.

7.2.2.10 Consultation

The EIS guidelines required MH/NCN to consult with the general public and affected communities about the Projects.

In addition, Section 35 of the *Constitution Act, 1982* affirms existing treaty and Aboriginal rights and creates an obligation for the Crown to consult with Aboriginal peoples in regard to a variety of matters including developments such as the Projects. The issue for the Commission to determine was whether the consultation provided for in the EIS guidelines was the same as or different from consultation under Section 35 of the *Constitution Act*.

7.2.2.10.1 MH/NCN Position - Consultation

MH/NCN developed a public involvement plan to provide the public, particularly those who may be potentially affected by the Projects, with early and ongoing opportunities to receive information and provide their views about the Projects. A focus of the plan was meaningful consultations with First Nation and Aboriginal people. MH/NCN submitted that the ongoing public consultation program is comprehensive and more than satisfies requirements in the Guidelines.

MH/NCN completed three rounds of consultation prior to submission of the EIS. Round one introduced the Projects to elected officials from communities in the Projects' region, while the second round extended discussion to community members through a series of community meetings and open houses. Round three meetings and open houses focused on key environmental effects of the Generation Project and measures to address those effects, as well as the preferred transmission-line routes.

MH/NCN emphasized that they consulted with potentially affected and/or interested communities to provide information on the Projects, responded to any questions or concerns, and identified ways in which benefits associated can be enhanced and negative effects reduced or mitigated. MH explained that its first contact with a First Nation community is through the Chief and Council and, in the case of other Aboriginal communities, through the Mayor and Council.

MH/NCN said that it is unclear what constitutionally protected or other rights the Métis have in Manitoba. They said that the Commission does not have to determine whether such rights exist, given MH/NCN's conclusions that the effects of the Projects will be fully mitigated and TSK was considered in the routing of the access road and the transmission line.

MH/NCN submitted that the Commission should acknowledge that consultations have been adequate and highly effective, and that the effects of the Projects have been adequately assessed, and that it can conclude that the concerns of persons whose activities could be affected by the Projects have been addressed.

7.2.2.10.2 Participant Positions - Consultation

Boreal Forest Network

BFN recommended that the Commission's report to the Minister of Conservation should not be prepared until a consultation process under Section 35 of the *Constitution Act* has concluded and the resultant report has been reviewed by the Commission. Any relevant observations or recommendations in the Section 35 report should be included in the Commission's report to the Minster.

Canadian Nature Federation

CNF submitted that the Supreme Court of Canada has made it clear that administrative bodies such as the Commission have the jurisdiction to consider questions of law such as constitutional issues, and noted that *The Environment Act* specifically contemplates that the Commission would consider legal issues such as the need for a consultation under Section 35 of the *Constitution Act.*

Community Association of South Indian Lake

CASIL submitted that there was a lack of appropriate involvement of the South Indian Lake community by MH/NCN in the Generation Project EIS. They contended that South Indian Lake's TSK was not included and that the effects of the Generation Project on their resource users were not considered.

A survey conducted at South Indian Lake showed that residents believe that the Projects will result in adverse effects and that their concerns are not reflected in the EIS. CASIL recommended that MH/NCN conduct a thorough cumulative-effects assessment and consult communities in the geographic area of the assessment. CASIL asked the Commission to recommend that MH/NCN and its consultants hold community workshops to explain the Projects to their members, document their concerns and use their TSK, and demonstrate how residual environmental effects on its members, land and resources will be mitigated. They also recommended creation of community advisory committees to provide input and oversight on ongoing decision-making regarding the CRD/AFP and the Generation Project.

Displaced Residents of South Indian Lake

DRSIL said that the NCN Chief and Council are pushing the Projects too quickly and without proper and thorough consultation. As a result, they said the consultation process had lacked the proper level of debate and questioning. DRSIL requested that independent legal counsel be appointed to explain the PDA and its implications to all NCN band members. DRSIL concluded that MH/NCN consultations had been a sham, creating confusion and concern among Nelson House members. Finally, they said MH/NCN had not consulted with them and that no community consultant visited them as part of the EIS.

Manitoba Métis Federation

The MMF submitted that because there was no meaningful and proper consultation, accommodation, and agreement with the Métis Nation, as one of the potentially affected Aboriginal peoples, the filings do not incorporate relevant sustainable-development expectations and good practices.

The MMF explained that an appropriate consultation must be undertaken with the MMF to address potential effects of the Projects on the Métis. These effects include infringements of Métis title, rights, interests and concerns.

The MMF requested that the Commission recommend that the Projects not proceed until full consultation, including resolution of reasonable accommodation and mitigation, with the MMF has been completed.

Mosakahiken Cree Nation

MCN noted that they were not consulted properly regarding the proposed transmission routes that border part of the pending Moose Lake RMA near Clearwater Lake. MCN recommended ongoing consultation with local persons, both Aboriginal and non-Aboriginal, for right-of-way clearing and environmental monitoring, and requested that MH/NCN consult with MCN on any planned activities and provide documentation on any required monitoring.

O-Pipon-Na-Piwin Cree Nation

OPCN is a group of South Indian Lake residents who are currently in the process of separating from NCN. OPCN submitted that they are environmentally, socio-economically and culturally different from NCN and on that basis they should be consulted separately. They contended that their distinct, separate and unique interests cannot be accurately represented by NCN, which have different interests, aspirations and goals.

OPCN recommended that their people should have an opportunity to consider and make a fully informed independent decision regarding a future development relationship with MH. This would include the potential sharing of the equity stream resulting from MH developments powered by water from Southern Indian Lake. OPCN requested that this take place in advance of formal recognition of OPCN by the Minister of Indian Affairs.

They recommended that the culture and socio-economic setting of South Indian Lake should be accurately portrayed in the EIS. This would allow them to monitor change and determine effects in relation to the commercial fishery, traditional harvesting and culture.

7.2.2.10.3 Presenter Positions – Consultation

The Government of Manitoba testified that Section 35 consultations are underway and were beyond the Commission's mandate.

7.2.2.10.4 Commission Comments and Observations - Consultation

The Commission is confident in commenting on consultations carried out in support of the EIS for the Projects, but it believes that comment on and consideration of Section 35 of the *Constitution Act* consultations are outside the Commission's mandate.

The Commission believes that MH/NCN have complied with the consultation requirements outlined in the Guidelines for the Projects. The EIS documents appear to contain a factual accounting of the consultations conducted with respect to the Projects and the comments and concerns expressed by the First Nations, stakeholders and the general public. The Commission notes, however, that not all potentially affected parties (for example, MCN) have been fully consulted and that there are outstanding issues that are not fully addressed in the EIS documents.

While CASIL submitted that consultations with MH/NCN were not meaningful, the Commission heard that CASIL cancelled meetings set up for both parties to consult on the Projects. The Commission encourages the parties to renew efforts to consult with CASIL on the Generation Project and other related matters, and to resolve the issues that stand between the parties.

The Commission is concerned that

consultations between MH/NCN and the Métis Nation on the Projects have not been undertaken to the satisfaction of the MMF. However, the Commission acknowledges that the Government of Manitoba, the MMF and MH are continuing to discuss the matter and that progress is being made towards resolving outstanding legal and policy issues.

The Commission is also concerned that consultation between MH and MCN regarding the routing of the transmission lines between the Herblet Lake Station and Rall's Island Station has not occurred. The Commission expects MH to consult on an ongoing basis with MCN and the Moose Lake Resource Management Board as requested by MCN. The Commission was encouraged by MH/NCN's invitation to MCN, made during the course of the hearings, to discuss MCN's concerns.

7.2.3 Assessment of the Projects

The overall MH/NCN position was that, because the Projects were designed to avoid and minimize adverse effects, they expected that the Projects would not result in significant adverse effects on the physical, biological or socio-economic environment. Those adverse effects that were anticipated in some areas were not considered to be significant and could be properly managed. Positive biophysical effects were predicted to result by displacing global greenhouse-gas emissions and by reducing annual fluctuations in Wuskwatim Lake levels that were caused by the CRD. MH/NCN also predicted positive socio-economic effects during construction and operation for people in the local region as well as throughout Manitoba.

These EIS propositions are examined in greater detail in the following assessment of the proposed projects:

- Physical Effects
- Biological Effects
- Socio-Economic Effects
- Cultural Effects

7.2.3.1 Physical Effects

The Commission identified and assessed the following categories for potential physical effects.

- The Hydrological Regime
- Erosion
- Suspended Solids
- Greenhouse Gases/Climate Change

7.2.3.1.1 Hydrological Regime

In the case of the Generation Project, the term hydrological regime refers to the river flows, water levels, discharges, water variability and ice conditions at the generating site, at upstream and downstream locations and the relationship to the operation of the CRD, the AFP and associated water-level and flow constraints.

7.2.3.1.1.1 MH/NCN Position – Hydrological Regime

Under the Generation Project proposal less than 0.5 km^2 or about 37 ha of land between Taskinigup Falls and Wuskwatim Falls will be flooded. MH/NCN considered these flooding effects in the immediate forebay area to be long-term, large in magnitude and localized.

Following completion of the Project, water levels on Wuskwatim Lake would be between 233.75 and 234.0 m asl under normal operating conditions (97.5% of the time). The 0.25 m variation is within the post-CRD lake levels. Average daily fluctuation of Wuskwatim Lake is predicted to be less than 0.06 m, with a maximum daily fluctuation of 0.08 m for the lake and 0.13 m for the immediate forebay. MH/NCN considered these daily water-level fluctuations on the immediate forebay and Wuskwatim Lake to be long-term, localized and small in magnitude with respect to the physical environment. MH/NCN indicated that Wuskwatim Lake would be lowered by up to 1.0 m under abnormal or emergency circumstances.

MH/NCN studies indicate that the Generation Project will affect water levels upstream along the Burntwood River as far as Early Morning Rapids, a distance of 27 km. Downstream levels will be affected as far as Birch Tree Lake, a distance of 40 km, although much of the downstream variation will be removed by the dampening effect of Opegano Lake, 13 km downstream. The effect of daily flow and water-level changes on downstream river channels and lakes was considered long-term, of moderate magnitude and local in scale. Water-level effects due to cofferdam construction were considered to be short-term and localized with respect to the physical environment.

MH/NCN expected that, with the implementation of mitigation measures, construction and operation of the Transmission Project would not have any significant effects on the water regime at or downstream from stream crossings.

MH/NCN stated that construction of the Generation Project would not lead to changes in the operation of CRD. However the Generation Project could result in a maximum increase in the level of Cross Lake of 0.36 ft and a maximum decrease of 0.26 ft. MH/NCN described these changes as minor compared with the average annual fluctuation of Cross Lake of about 4 ft since the construction of the Cross Lake Weir in 1991.

7.2.3.1.1.2 PARTICIPANT POSITIONS – HYDROLOGICAL REGIME

Consumers' Association of Canada/Manitoba Society of Seniors Inc.

The CAC/MSOS commented that none of the interveners had presented a valid case why the Generation Project should not be built. No evidence has been presented to substantiate the concerns that the Generation Project would further exacerbate the effects of the CRD or to challenge MH/NCN's assertions that the Projects will operate within the parameters of the already existing regulated system.

Community Association of South Indian Lake

A report prepared for CASIL noted that Manitoba Water Stewardship has the ability to unilaterally vary licences governing hydrological regimes. The report suggested that MH could not guarantee that the regime it is proposing could not be subsequently amended. The report recommended that a formal committee comprising South Indian Lake and MH representatives be established, a monitoring program be set up to study environmental parameters, and a remedial works plan be developed to identify mitigation measures to address the concerns of South Indian Lake.

Pimicikamak Cree Nation

PCN stated that the effects of both the current hydrological regime and changes that will result from the Generation Project, have been and will continue to be extremely negative. They maintained that MH has refused to acknowledge that there exists a lack of knowledge of the effects of the current MH system, including the effects of LWR and CRD. As a result of this lack of knowledge, it is not possible to determine what the effects of the Generation Project would be on the current situation.

PCN stated that MH had originally denied that the Generation Project would have any effect on the existing system to which it would be added. MH subsequently indicated that there would be system effects that would affect Cross Lake, but these effects would be minimal. Based on past experience with MH, PCN challenged this assertion, contending that the people, the land and the water have suffered adverse effects.

PCN further stated that there has been no review or comprehensive analyses of effects from the existing hydroelectric system and no environmental licence requiring monitoring or mitigation.

7.2.3.1.1.3 COMMISSION COMMENTS AND OBSERVATIONS – HYDROLOGICAL REGIME

The Commission noted that there was very little criticism of the Generation Project itself during the public hearing. This was attributed to the low-head design and proposed operation of the generation station, the incorporation of TSK into the station design, and the relatively small areas affected by its operation.

MH/NCN presented considerable evidence with respect to both the design and operation of the generation station and to resulting water levels. MH/NCN used these predicted levels to assess the environmental effects of the Project. The Commission expects that any licence granted to MH/NCN for the Generation Project will specify the hydrological regime that MH/NCN is expected to adhere to. In the opinion of the Commission, that should include the following provisions.

1. Any licence for the construction and operation of the Generation Project be subject to the following:
   - A nominal forebay water level elevation of 234.0 m asl.
   - Maximum permissible daily flow change through the generation station of 330 m^3/s under normal operation and 440 m^3/s under temporarily modified operation.
   - Maximum daily drawdown of the immediate forebay under normal operating conditions of 0.13 m.
   - Maximum daily drawdown of Wuskwatim Lake under normal operations of 0.08 m.
   - Operation in accordance with all existing licenses and agreements for the Churchill-Burntwood waterway system and LWR.
2. Minimum forebay water level under abnormal or emergency operation of 233.0 m asl.
3. Immediate notification of the regulator of any operation under emergency mode and the resulting flow changes, and the magnitude of upstream and downstream water-level fluctuations.
4. Frequent reporting to the regulator of information relating to pertinent generation station operations including, but not limited to, flows through the station, water spilled, forebay water levels, emergency operation, upstream and downstream water-level fluctuations, and any deviation in operation and water-level fluctuations from that predicted in the licensing applications for the Projects. This information should be readily and easily available to the public.
5. Regular reporting of pertinent information with respect to the operation of CRD and LWR and any effect resulting from station operations. This should include a comparison to effects predicted in the licensing applications for the Projects. This information should be

readily and easily available to the public.

These provisions are included in the licensing recommendations in section 7.2.4 of this chapter. In addition to these licensing provisions, the Commission believes that MH should:

- meet on a regular basis with First Nations, other Aboriginal communities and affected parties with regard to the operation of CRD, the Missi Falls Control Structure, LWR and the forecast levels of Southern Indian Lake.
- resolve all outstanding issues with regard to the CRD, AFP and LWR such that they are in a position to apply to the Government of Manitoba for permanent licences as soon as possible.

The Commission will also be making recommendations to this effect.

7.2.3.1.2 Erosion

7.2.3.1.2.1 MH/NCN Position - Erosion

MH/NCN stated that shoreline erosion is a natural process in lakes and reservoirs, the effects of which include recession of banks, near shore downcutting (this refers to the collapse of shoreline when soils below water level are eroded), depositing of eroded shore zone material in near shore and offshore areas, and transport of suspended sediments downstream. Wind energy and waves, water levels, the presence of debris, shoreline geometry and the nature of the shoreline material can all affect erosion rates. While increases in water levels accelerate the short-term erosion rate, these rates return to long-term averages over time.

When the CRD went into full operation in 1977, increased water levels led to a significant increase in erosion rates. MH/NCN measurements indicate these rates are slowly returning to near long-term pre-CRD rates.

An MH/NCN study assessed the ongoing shoreline-erosion process and bank-recession rates under the present conditions at Wuskwatim Lake to predict future bank-recession rates under existing conditions and to predict bank-recession rate changes that may result from construction of the Generation Project. The study also estimated the land area and volumes of shoreline material that would be eroded over these same time frames, with and without the Projects. Based on the study results, MH/NCN projected future shoreline locations around Wuskwatim Lake, with and without the Project, for the 5-, 25- and 100-year periods after the in-service date. The study concluded that shoreline erosion around Wuskwatim Lake would accelerate as a result of the increased average lake level. Erosion rates are predicted to be highest in the early years of Project operation, declining to post-CRD diversion rates after about 25 years.

MH/NCN expressed confidence in the conclusions based on erosion data collected from 45 monitoring sites over 10-12 years, extensive classification of Wuskwatim Lake shorelines, the collection of local wind data, the proposed reservoir, and the collective judgment of professional engineers with experience in northern Manitoba.

MH/NCN does not expect that, with the implementation of appropriate mitigation measures, construction and operation of the Transmission Project would have any significant effects on erosion and sedimentation at or downstream from stream crossings.

The increased rate of erosion of the Wuskwatim Lake shoreline will result in additional woody debris entering the lake over the first five years of the Project from shorelines that are actively eroding. MH/NCN indicated that relative to the existing debris along the shoreline, the incremental increase in debris would be insignificant. They stated that the issue of woody debris was discussed with NCN Elders at several workshops. There was a difference of opinion between the consultants and the Elders with regard to the degree of debris mobilization that may result from increased lake levels. Based on TSK, the Elders felt that there would be increased debris mobilization, while the consultants were of the opinion that there would probably not be. While the consultants and Elders respected their disagreement on this issue, they did agree on a management strategy to deal with either scenario.

7.2.3.1.2.2 Participant Positions - Erosion

Pimicikamak Cree Nation

PCN spoke of increased bank instability and erosion that resulted from changing water levels on Cross Lake.

7.2.3.1.2.3 Commission Comments and Observations – Erosion

The Commission considers that MH/NCN has undertaken reasonable efforts to determine the effects of the Project on erosion rates and how the resulting increase in erosion rates will affect the physical environment. It will be recommending that provision for monitoring and mitigation of erosion effects be included in any licence issued for the Generation Project.

7.2.3.1.3 Suspended Solids

Total suspended solids (TSS), is a measure of the amount (weight) of particles in suspension in a liquid and provides a measure of water clarity.

7.2.3.1.3.1 MH/NCN Position – Suspended Solids

MH/NCN stated that long-term total-suspended-solids data collection indicates that the concentration of sediments in the Burntwood system of 13 mg/ L is similar to pre-CRD levels. They acknowledged that, while TSS concentrations may have returned to pre-CRD conditions, total sediment loads have increased about 8 times due to the increased volume of water flowing down the CRD.

MH/NCN described Wuskwatim, Opegano and Birch Tree lakes as meso-eutrophic (meaning that they are lakes of intermediate productivity) with TSS ranging from <2 to 24 mg/L while the Burntwood River in the study area is described as highly turbid with TSS ranging from < 5 to 24 mg/L. The predicted increases in TSS above background levels due to construction activities falls within the Government of Manitoba short-term water-quality objective. It is expected that there may be periods during construction when the 30-day averaging duration of an increase in TSS of 5 mg/L above background may be exceeded. However, MH/NCN does not expect that exceeding this 30-day guideline for several weeks during construction will result in a significant change in aquatic biota.

MH/NCN studies indicate that erosion of the Wuskwatim Lake shoreline will increase in the short term, resulting in the release of more sediment. The increase in sediments released into Wuskwatim Lake will begin to moderate after about five years and is expected to be the same as it would be without the Project after 25 years. Sediments will also be released into the Burntwood River during construction of the Project, particularly during construction and removal of the cofferdams. Overall, MH/NCN expects construction-related increases in TSS and related parameters to cause negative effects on the suitability of water for aquatic life but it did not anticipate that these effects would be significant.

Similarly, while MH/NCN expects increases in TSS and related parameters from operational activities to have a negative effect on the use of water for drinking, its suitability for aquatic life and its aesthetics, it did not anticipate that these effects would be significant. No significant changes to TSS or turbidity are expected in the Burntwood River, Lake Opegano and downstream during operation, although there may be some increases due to inputs from upstream when erosion on Wuskwatim Lake is increased as a result of storms.

MH/NCN does not expect that construction and operation of the Transmission Project will have any significant effects on water quality at or downstream from stream crossings subject to the implementation of mitigation measures where required.

With respect to water quality, MH/NCN submitted that water has been monitored at various lake and river sites from upstream of the anticipated extent of water-level changes through the Wuskwatim Lake area, and downstream in Opegano and Birch Tree Lakes to encompass the spatial extent of effects to water quality. In addition, water-quality conditions have been measured at a number of sites further downstream. MH/NCN said water-quality monitoring will continue through the first 15 years of the construction and operation of the Projects. At that point the need for further monitoring will be considered based on an assessment of results.

7.2.3.1.3.2 PARTICIPANT POSITIONS – SUSPENDED SOLIDS

Community Association of South Indian Lake

CASIL argued that effects on water quality should define the geographic scope of the environmental assessment. They noted that water flows from South Bay of Southern Indian Lake down the Burntwood River and through Wuskwatim Lake. Suspended sediments resulting from ongoing erosion on Southern Indian Lake contribute about 315,000 tonnes/year to Wuskwatim Lake. Increased suspended solids from construction and operation of the Generation Project will add to the suspended-sediment load, resulting in cumulative effects. CASIL went on to argue that the determination of significance of increased suspended solids was arbitrary and did not recognize that Government of Manitoba's water-quality guidelines would be exceeded during construction and removal of the cofferdam.

7.2.3.1.3.3 COMMISSION COMMENTS AND OBSERVATIONS – SUSPENDED SOLIDS

The Commission notes that increasing the level of Wuskwatim Lake will lead to increases in the rate of shoreline erosion and in the sediments being transported offshore and possibly downstream. Sediments will also be released into the Burntwood River during Project construction, particularly during construction and removal of the cofferdams.

No significant concerns were identified for other water-quality parameters. The Commission notes that while MH/NCN felt that water-quality effects of the project would not extend beyond Birchtree Lake, water-quality sampling was extended first to an area downstream of Thompson and subsequently to an area just upstream of Split Lake as a result of concerns expressed at meetings with downstream communities. MH/NCN explained that at this point the monitoring program meets with another monitoring program that extends all the way to the Hudson Bay estuary. MH/NCN indicated that they planned to continue their water-quality-monitoring program for both the construction phase and the ongoing operation of the Generation Project

The Commission is satisfied with the proposed monitoring program that examines a broad range of parameters including total suspended solids, nutrients and a full range of metals.

The Commission will be recommending that provision for monitoring and mitigation of water-quality effects be included in any licence issued for the Generation Project.

7.2.3.1.4 Greenhouse Gases/Climate Change

Greenhouse gases (GHG) include methane, carbon dioxide and chlorofluorocarbons emitted from a variety of sources and processes that contribute to global warming by trapping heat between the Earth and the upper atmosphere. Climate change refers to a change in climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods

7.2.3.1.4.1 MH/NCN POSITION - GREENHOUSE GASES/CLIMATE CHANGE

MH/NCN reported that the Projects' greenhouse-gas implications are very small compared to most Canadian or international hydroelectric projects. Furthermore, the amount of flooding and potential for increased greenhouse-gas emissions will be minor. The Projects were considered to have a significant net effect of reducing global greenhouse-gas emissions since they displace emissions from natural-gas and coal-fired resources predominately outside of Manitoba. MH/NCN considered the effects of climate change on the financial aspects of the Projects by providing a sensitivity analysis that forecasts a 10% flow reduction on the Burntwood River.

Forests absorb carbon dioxide, which is a greenhouse gas, through photosynthesis. When trees are cut down there is a lessening of the forest's ability to absorb this biomass carbon. MH/NCN reported in the Transmission Project EIS that the effect on biomass carbon due to tree cutting for the Project amounted to 79,504 tons; however, recovery post-construction within 5-10 years is estimated to be 19,946 tons, resulting in a total impact on biomass of 59,558 tons. The effects from the Transmission Project activities were determined to be minimal. The effects on soil organic carbon pools were considered to be localized and not quantifiable.

Based on current projections, MH/NCN does not expect that climate change will have a significant effect on the Transmission Project during its lifecycle.

MH submitted that it has been actively tracking the results of the various global climate models and reported that, while the models agree that temperatures will tend to increase, they vary in terms of projections of long-term precipitation trends. It was contended that the net effect of increased precipitation on runoff and river flow remains uncertain. Most of the models tested by MH predict increased precipitation for the Project region.

MH has been actively involved in other climate-change research activities, funding over $0.5-million in research and contract work over the past 10 years to better understand climate change. It is currently funding projects on the upper Churchill

River, Winnipeg River and Red River basins, and has announced an intention to fund climate-change research at the Universities of Winnipeg and Regina, for a total of $0.25-million. MH also noted that it is represented on the Board of Directors for the ArcticNet Research Project which is a four-year $25-million project investigating the impact of climate change on the Arctic in the Hudson's Bay watershed.

7.2.3.1.4.2 PARTICIPANT POSITIONS - GREENHOUSE GASES/CLIMATE CHANGE

Boreal Forest Network

BFN contended that MH/NCN failed to sufficiently explore climate change issues that will have an impact in northern Manitoba. It requested the Commission recommend that MH be mandated to develop a clear and concise climate change policy.

Community Association of South Indian Lake

CASIL questioned MH/NCN on the use of sulfur hexafluoride (SF_6), a greenhouse gas with a high ozone-depletion factor, in circuit breakers and switches along the transmission line. MH/NCN explained that releases of SF_6 are possible but they are monitored through inventory control and reported in their Voluntary Challenge Registry (VCR) report. CASIL went on to ask why SF_6 was not included in the Pembina Institute Report prepared for MH, while nitrous oxide (N_2O) was included. Both gases are relatively small components of the overall greenhouse-gas issue. MH/NCN explained that greenhouse-gas emissions are reported in its VCR report and that total emissions from their hydroelectric operations are decreasing over time. CASIL questioned whether there was any proof for MH/NCN's assertion that the Projects will result in a significant reduction in greenhouse-gas emissions by displacing emissions from coal-fired generating stations in the U.S. CASIL also contended that the effects of climate change are unknown and no assessment has been made on the information that exists.

Canadian Nature Federation

On behalf of CNF, Ms. Elizabeth May, Executive Director, the Sierra Club of Canada, said that EIS documents paid little attention to the science of climate change. She expressed concern over MH/NCN's doubts about the relative role that natural and unnatural sources of greenhouse-gas emissions play in effecting global climate change. The Sierra Club noted that the international scientific consensus on climate change is that climate has been warming and will continue to warm for the foreseeable future. Furthermore, she said the consensus holds that the warming is largely due to human activity, and the consequences of rising temperatures are grave enough to warrant global action.

The Sierra Club of Canada argued that the Generation Project depends on reliable and predictable levels of water flow, noting that climate-change science suggests that future climate change will not be predictable. It submitted energy alternatives that contribute directly to reducing greenhouse-gas emissions, protecting biodiversity and stimulating the economy should have been addressed.

CNF remarked that references in the EIS documents regarding doubt about the role played by solar, volcanic and human-caused greenhouse-gas emissions in causing climate change are misleading. CNF took issue with MH/NCN's dismissal of climate-change science as having nothing useful to contribute to the Generation Project EIS. CNF requested that MH/NCN be required to conduct a thorough review of alternatives to aid in making a decision on the long-term interests of

Manitoba and to update the EIS to include climate change effects on the viability of the Projects.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

TREE/RCM noted that the projected impact of global warming would greatly reduce the boreal forest in Manitoba. However, it viewed energy conservation, rather than the displacement of fossil-fuel generation with hydroelectric power, as the preferred method to mitigate greenhouse-gas emissions.

TREE/RCM stated that improving the ratio of social benefits to environmental harms and resource depletion is an essential pillar of a sustainable society. TREE/RCM noted that while *The Manitoba Hydro Act* contemplates the export of power, provision of power for export must adhere to the same principles of sustainability. They also noted that the case for export would be stronger if power were to be sold into jurisdictions committed to sustainability including adherence to the Kyoto protocol for greenhouse-gas reduction.

7.2.3.1.4.3 COMMISSION COMMENTS AND OBSERVATIONS – GREENHOUSE GASES/CLIMATE CHANGE

The Commission accepts MH's assertion that the Projects will reduce greenhouse-gas emissions by displacing electricity produced by natural-gas and coal-fired plants in the U.S. However, the Commission believes that MH should attempt to track and report on predicted greenhouse-gas reductions in jurisdictions to which it exports electricity.

The Commission also noted that the EIS documents do not demonstrate that MH/NCN's information on climate change is, in fact, consistent with the CEAA guidance for practitioners on incorporating climate change consideration in environmental assessment. For example, when a project may contribute to GHG emissions, the CEAA's recommended procedures include:

- Preliminary scoping for greenhouse-gas considerations
- Identify greenhouse-gas considerations
- Assess greenhouse-gas considerations
- Greenhouse-gas management plans
- Monitoring, follow-up and adaptive management

In addition, where climate change may affect a project, CEAA's recommended procedures include:

- Preliminary scoping for impacts considerations
- Identify impact considerations
- Assess impact considerations
- Impacts management plans
- Monitoring, follow-up and adaptive management

The Commission will be recommending that provision for monitoring and mitigation of greenhouse-gas emissions and related effects be included in any licence issued for the Projects.

7.2.3.2 Biological Effects

The Commission identified and assessed the following categories for potential biological effects.

- Woodland Caribou
- Fish Productivity
- Protected Areas

7.2.3.2.1 Woodland Caribou

Manitoba has two varieties of the boreal subspecies woodland caribou (*Rangifer tarandus caribou*) in a total of 16 herds. The

14 distinct herds of the boreal forest are widely dispersed from the Bird River in the southeast to Lynn Lake in the northwest. These herds use different parts of their home range on a seasonal basis. Between 2,000 and 2,500 woodland caribou form these 14 smaller herds.

7.2.3.2.1.1 MH/NCN POSITION – WOODLAND CARIBOU

MH/NCN obtained information on woodland caribou using TSK and WSK approaches. NCN resource harvesters were actively involved in the surveys. The MH/NCN analysis incorporated changes in caribou habitat, sensory disturbances and access-related changes in mortality.

MH/NCN reported that while the effect of Project construction and operation on woodland caribou would be negative, small, regional, and long-term, the overall effect would be insignificant. Most expected effects were determined to be mitigable or reversible. Certainty regarding the effects was determined to be moderate. Caribou were predicted to experience a small loss and alteration of habitat at the generation-station footprint, access road and borrow areas. (A footprint is the land and/or water covered by a project. This includes direct physical coverage and direct effects.) The maximum extent of physical losses of primary habitat in the upland region of the Projects was estimated to be less than 0.2% of the caribou in that region. Small effects from sensory disturbances, loss of habitat effectiveness and possibly habitat fragmentation were also predicted. The maximum effects were estimated to be less than 1% of the caribou in the region.

Anticipated environmental effects of construction and operation of the Transmission Project were reported by MH/NCN to be small to moderate for the transmission-line rights-of-way and moderate, long-term and site-specific for the transmission stations. Small effects were anticipated on the local area, in the vicinity of transmission-line rights-of-ways and station sites, but the overall effect on wildlife was determined to be insignificant. Based on modeling results, MH/NCN suggested that right-of-way clearing would result in the direct disruption and modification of 12 km^2 of equivalent prime woodland caribou habitat that would support 0.27 caribou. It was expected that the rights-of-way would have no adverse influence on caribou movement across the transmission line. MH/NCN predicted that vehicle traffic associated with the rights-of-way and related access trails may result in short-term alteration of caribou movement, particularly during the construction period.

MH/NCN concluded that the residual effect of construction and operation of the Projects would result in negative, small, regional and short and long-term, and therefore, insignificant effects. It was noted that measures to conserve and safeguard caribou habitat with respect to the Transmission Project would be included in the environmental protection plans. With respect to the Generation Project, MH/NCN also noted that many of the protection and mitigation measures for soil and vegetation would also serve to protect caribou habitat.

MH/NCN described how both WSK and TSK were used to estimate woodland caribou numbers. Using their local knowledge, NCN Elders estimated the population of caribou in the Project area to be about 200 animals. After two years of expensive aerial surveys, biologists also concluded that the estimated number of caribou in the area was 200. NCN Elders' prediction of the distribution of caribou in the Nelson House RMA was subsequently matched by radio-collar tracking.

MH/NCN submitted that the Commission could make its final recommendations in full confidence that there are no significant effects of the Projects on woodland caribou. It was anticipated that all potential effects would be mitigated by MH/NCN in accordance with their joint planning and management of the Projects. MH/NCN concluded that the evidence obtained through TSK is that the number of caribou has increased due to its management programs.

MH/NCN concluded that the general concerns expressed by the Participants do not provide fair comment on the detailed technical and traditional work done by MH/NCN and do not provide a basis for challenge to the route selections and other conclusions drawn by MH/NCN's team.

7.2.3.2.1.2 PARTICIPANT POSITIONS – WOODLAND CARIBOU

Boreal Forest Network

Dr. James Schaefer of Trent University explained that caribou operate on broad scales (meaning their habitat is not restricted to a specific area) and need to be managed at the landscape level (a concept that refers to managing wildlife over a broad area with various ecological components). He noted that caribou appear to be among the most sensitive wildlife species to disturbances arising from human activities, and that the effects of the Projects on caribou can be anticipated to extend beyond the Project's footprint. Dr. Schaefer estimated that caribou population losses would be 2 to 41% due to diminished habitat. He explained that increased access by subsistence hunters and poachers could jeopardize the presence of caribou in the study area. Dr. Schaefer recommended an adaptive-management approach that would involve treating the Projects as an experiment involving long-term monitoring and hypothesis-testing.

Canadian Nature Federation

Dr. E. M. Bayne, of the University of Alberta, spoke on the effects of the Projects on biodiversity in the boreal forest. He described how linear features such as transmission-line corridors result in increased wolf and coyote predation on moose and caribou. Linear features also can become travel corridors for people, resulting in increased hunting, fishing and overall levels of disturbance. Dr. Bayne concluded that power lines result in habitat loss and edge effects (the term for the environment issues that developed at the edges of a habitat).

Mr. Dan Soprovich, Bluestem Wildlife Services, Manitoba, provided information on Habitat Suitability Index models, which were employed by MH/NCN in their assessment of caribou. He explained that the scientific literature indicates an almost universal failure of these models. He said that Canadian and Manitoba scientists recognize this failure and caution against their use. Examples were given for several wildlife species showing how basic model assumptions cannot be met and the models fail when tested. Mr. Soprovich concluded that MH/NCN findings on the Projects should be rejected.

CNF argued that MH/NCN's estimated decline in woodland caribou of less than 0.5% animals is an underestimate and does not reflect the scientific literature. Their best scientific knowledge indicated that effects would occur 250 to 5,000 m beyond the power lines, giving rise to caribou losses 7.5 to 150 times those predicted in the EIS. CNF recommended that independent experts redo the scientific work on woodland caribou.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

TREE/RCM called for further data on the caribou range in areas potentially affected by the Wuskwatim dam and transmission corridors.

7.2.3.2.1.3 COMMISSION COMMENTS AND OBSERVATIONS – WOODLAND CARIBOU

The Commission heard arguments by MH/NCN that the woodland caribou populations in the Project region are stable or increasing, and that the Projects will have no significant effects on caribou. It also heard arguments from caribou experts that, while the species is sedentary, it does move throughout its range and is subject to mortality from predation, parasites and disease, as well as from hunting. The Commission also appreciates that, according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the boreal population of woodland caribou is a threatened species. Furthermore, caribou are slowly disappearing from southern parts of their range due to the encroachment of human activity.

Based on these arguments, the Commission is of the opinion that MH/NCN should fully consider the direct and indirect effects of the Projects beyond their physical footprint, including the implications to caribou behaviour. This is also of importance in the consideration of cumulative effects of the Projects on caribou in conjunction with the effects of other projects and activities in the region. However, MH/NCN should not be solely responsible for conducting or funding regional monitoring and research on caribou. It is a matter for provincial-federal cooperation involving MH, First Nations and others as partners.

Accordingly, the Commission believes that Manitoba Conservation should encourage and support cooperative research on woodland caribou in northern Manitoba. The Government of Manitoba should continue to work with First Nations, other Aboriginal communities, environmental organizations and stakeholders, including MH, on the refinement and implementation of Manitoba's woodland caribou strategy. The Government of Manitoba should also continue to cooperate with federal species-at-risk representatives to explore management strategies for woodland caribou. This should include the establishment of refugia (locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range) in northern Manitoba as part of a national/provincial recovery strategy for the species.

The Commission will be recommending that provision for monitoring and mitigation of effects on caribou population be included in any licence issued for the Projects.

7.2.3.2.2 Fish Productivity

7.2.3.2.2.1 MH/NCN POSITION – FISH PRODUCTIVITY

MH/NCN used WSK and TSK approaches to assess the effects of the Projects on the aquatic environment. Discipline-specific professionals, assisted by competent technical staff and informed NCN members, conducted the aquatic studies using proven techniques and procedures. The methods included consultation with NCN leadership and members regarding their traditional knowledge and resource use, and their concerns and expectations in regard to the Projects.

MH/NCN reported that construction and operation of the Wuskwatim generation station would result in the permanent loss of a small amount of aquatic habitat due to placement of the main dam. Some in-stream fish habitat will also be lost immediately downstream from the dam and at stream crossings. Reduced water-level fluctuations on Wuskwatim Lake would increase the habitat, resulting in an increase in invertebrates and forage fish, and spawning habitat available to fish. Initially, increased erosion may reduce the suitability of some areas for invertebrates and fish, but over the longer term, increases are predicted for key fish species. MH/NCN determined that, due to water-level fluctuations and decreased movements, adverse effects on fish and fish habitat would extend a short distance downstream to Opegano Lake.

Overall, MH/NCN predicted that the net effect on fish in the study area would be positive, with small increases in fish production.

MH/NCN 's draft fish habitat compensation plan, submitted to the DFO in January 2004, outlined initiatives to compensate for the loss of fish habitat. These included a variety of stabilization, modification and enhancement measures on Wuskwatim Lake and adjoining waters and in the vicinity of Nelson House. The compensation plan was intended to improve fish habitat already affected by the CRD and AFP. MH/NCN will be required by the *Fisheries Act* to conduct a monitoring program to describe relevant biological parameters both prior to and after the implementation of the compensation works.

MH/NCN stated that the fish habitat compensation plan submitted to the DFO would provide additional positive effects to fish and fish habitat in the study area. MH/NCN made a commitment to monitoring the effects of construction and operation of the Generation Project on the aquatic environment to verify predictions and assess the effectiveness of mitigation measures and compensation.

7.2.3.2.2.2 PARTICIPANT POSITIONS – FISH PRODUCTIVITY

Community Association of South Indian Lake

CASIL said that significant aspects of the environment were excluded from the Generation Project EIS, noting that only four fish species and water quality were assessed for the significance of residual effects after mitigation. They questioned why similar consideration was not given to key-indicator fish species of ecosystem health and other species in the food chain that inhabit the water.

7.2.3.2.2.3 COMMISSION COMMENTS AND OBSERVATIONS – FISH PRODUCTIVITY

The CRD and AFP resulted in significant adverse effects on fish and fish habitat in water bodies, including Wuskwatim Lake, along the diversion route. MH/NCN's prediction that the Generation Project will improve fish production in Wuskwatim Lake and the region is therefore welcomed. The Commission believes, however, that this prediction needs to be tested in terms of productivity levels, species composition and time-frame. For this reason, the Commission will be recommending that provision for monitoring and mitigation of impact on fish production be included in any licence issued for the Generation Project.

7.2.3.2.3 Protected Areas

Manitoba's network of protected areas is made up of a collection of different land classifications including federal and provincial parks, ecological reserves, wildlife management areas and provincial forests. Private lands can also be part of Manitoba's network of protected areas. These protected areas differ from sacred or ceremonial sites.

Logging, mining (including aggregate

extraction), and oil, petroleum, natural-gas or hydroelectric development are prohibited in these areas. Protected areas with this minimum level of protection remain open for activities such as hunting, trapping or fishing.

7.2.3.2.3.1 MH/NCN Position

MH/NCN stated in the Generation Project EIS that, with the implementation of mitigation measures, there would be no significant adverse direct or indirect effects on protected areas. NCN resource harvesters determined that the Project would result in significant, positive, long-term, moderate and regional effects on resource use in their traditional areas, primarily due to increased access. MH/NCN also noted that improved access might also lead to a marginal increase in mineral activity and tourism and recreational activities in the Wuskwatim Lake area.

Through the Site Selection and Environmental Assessment (SSEA) process used for the Transmission Project EIS, MH/NCN sought to avoid adverse effects and enhance benefits wherever possible and practical. MH/NCN concluded that the Transmission Project is not expected to cause significant adverse environmental effects on protected areas given the proposed mitigation measures. A portion of the Herblet Lake to Rall's Island transmission line will cross part of Clearwater Provincial Park in an area where recreational use is low and commercial forestry resources are limited.

MH/NCN commented that Manitoba Parks and Natural Areas Branch mapping indicates that representation by certain protected areas of the Churchill River Upland, Hayes River Upland and the Mid-Boreal Lowland, as well as existing designated areas (Clearwater Lake Provincial Park and Tom Lamb Wildlife Management Area) and areas of special interest within the Projects' region, may be affected by the Projects. MH/NCN also noted that MH has worked cooperatively with Manitoba Conservation in their efforts to identify and designate protected areas and will continue to be supportive of these efforts in the future.

7.2.3.2.3.2 Participant Positions – Protected Areas

Canadian Nature Federation

CNF submitted that the EIS documents are deficient on protected areas, questioning whether MH/NCN agrees with Manitoba's protected area policy and the establishment of protected areas. CNF requested that the Commission specify MH/NCN's responsibilities for protected areas and other public policies respecting the Projects and indicate whether the policies are being fulfilled. CNF also contended that the EIS failed to reflect the threat to proposed protected areas and expressed concern that the impact on fragmentation of the boreal forest through clearing of rights-of-way and transmission lines has not been adequately addressed.

7.2.3.2.3.3 Commission Comments and Observations – Protected Areas

The Commission accepts MH/NCN's prediction that the Projects will not likely have significant adverse effects on protected areas with the implementation of mitigation measures. However, the EIS documents do not adequately address direct and indirect effects beyond the Projects' footprint.

The Commission will be recommending that provision for monitoring and mitigation of impact on protected areas be included in any licence issued for the Projects.

7.2.3.3 Socio-Economic Effects

7.2.3.3.1 MH/NCN Position - Socio-Economic Effects

MH/NCN submitted that employment opportunities associated with the Projects primarily occur during the construction phases. Construction of the Generation Project will occur in two phases: 1) infrastructure, and 2) major construction works, with a maximum of approximately 250 and 540 positions at each stage, respectively. The Transmission Project would offer limited employment opportunities. Construction of the Generation Project would be governed by the BNA, which is currently being negotiated and will apply to all workers at the site except for contractors, supervisory and management positions and MH staff. The BNA would prohibit strikes or lockouts for the duration of the Project.

According to an MH economic-impact assessment, direct and indirect employment from building, operating and maintaining the Projects is expected to total 9,830 person-years of employment in Canada, including 611 person-years for northern Manitoba Aboriginal people.

Overall social net benefits to Manitoba and Canadian economy total $107- to $211-million in the low-export-price scenario and $151- to $380-million in the expected- and high-export-price scenarios. The benefits include government and other transfers, employment and other income effects, environmental and social effects, and greenhouse-gas reductions. These benefits were reported to accrue to MH, its customers, NCN, taxpayers, Aboriginal communities, workers and the global environment.

NCN explained that it is developing pre-project training programs for its members to prepare for employment opportunities during construction of the Generation Project. Training will be available for positions in the designated trades as well as the non-designated trades and construction-support occupations. Pre-project training will also be available to other Aboriginal residents in northern Manitoba. MH/NCN said that employment effects for Aboriginal residents are not significant in number and are seasonal and short-term for the Transmission Project, and significant in number and short-term in duration for the Generation Project.

With respect to job guarantees, MH/NCN submitted that, particularly for highly skilled positions, construction work is a career choice requiring significant commitments to training and work experience. Job guarantees, in isolation, are not seen by MH/NCN as a substitute for gaining training and work experience. Instead of pursuing the short-term goal of job guarantees, NCN has taken a long-term capacity-development approach to securing employment. This approach is built upon an expected employment preference for Wuskwatim, a multi-year plan for pre-project training, and negotiated contracts with MH.

As noted in Chapter 6, there would be a review mechanism to ensure that contractors do not disqualify Aboriginal job seekers by establishing unreasonably high job qualifications.

7.2.3.3.2 Participant Positions – Socio-Economic Effects

Community Association of South Indian Lake

CASIL questioned why MH and southern Manitobans benefit from hydroelectric development on northern rivers while Aboriginal communities continue to suffer from the ongoing effects of the original developments. In particular, CASIL asked why

South Indian Lake does not receive any of the financial benefits that arise from the use of Southern Indian Lake as a reservoir for the CRD. CASIL observed that MH has recognized that the past approach does not work and that partnership with First Nations is the key to the long-term viability of projects. They contended that the people of Southern Indian Lake area need assurances that revenue sharing, economic benefits and employment opportunities will flow directly to them. CASIL recommended that the community of South Indian Lake receive an equitable share of the revenue generated from the use of Southern Indian Lake as a reservoir.

Manitoba Métis Federation

The MMF submitted a 2002 memorandum of understanding regarding the establishment of a MMF-Hydro employment working group. The memorandum, which recognizes the MMF as the representative for the Métis within Manitoba, sets out MH's workforce targets of 10% Aboriginal corporate-wide and 33% in northern Manitoba by 2005.

O-Pinon-Na-Piwin Cree Nation

OPCN argued that their people live on the reservoir that drives MH turbines all the way down to the Burntwood and Nelson rivers. They suggested that an equity position in the Generation Project would go a long way toward establishing a new relationship with MH.

OPCN said the proposed employment monitoring with the local region needs to separate the effects experienced by South Indian Lake and Nelson House residents. This would allow OPCN to analyze the results and determine appropriate follow-up action.

Pimicikamak Cree Nation

PCN submitted that the economic viability of the Projects does not account for the costs of operational system effects including those borne directly by PCN and indirectly by the governments of Manitoba and Canada.

7.2.3.3.3 Presenters Positions - Socio-Economic Effects

Nine youth members of the NCN spoke to the Commission about their concerns for the community's future. They stated that, while they respected the view of those in the community who opposed the Projects because of their experience with CRD, they did not believe that the community could continue to depend on the traditional economy of hunting and fishing. They said that they did not believe their lives would be affected by the Projects in the same way as their elders' lives were affected by the CRD. Instead, they believed the Projects offered them short- and long-term opportunities to meet immediate challenges and address future concerns. For these reasons, they supported their chief and council and the Future Development Team that was working with MH on the Projects.

An NCN member living in Winnipeg said that she opposed the Projects in their current form, questioning where NCN's funding for its equity share would come from.

A representative of Fox Lake Cree Nation stressed that Manitoba Hydro and the Governments of Manitoba and Canada need to partner with First Nation communities to invest in the northern environment. For this to happen, there must be a serious reinvestment and rehabilitation of the physical environment. A policy of reinvestment has the potential to provide economic benefits for the communities of the North.

A member of TCN described that First Nation's vision of the future as a self-governing First Nation with the ability to provide a secure, sustainable economy for the members now and in the future. The member believed that it is possible to realize such a vision through the shared use of resources. It was stressed that such sharing must be built on a long-term regional development strategy that can only succeed if it reflects an understanding of the Cree worldview and focuses on sustaining the natural environment through careful planning.

The Manitoba Industrial Power Users Group, which consists of eight of the largest industrial companies in Manitoba including Nexen Chemicals Ltd., INCO Manitoba Division, Hudson Bay Mining & Smelting, ERCO Worldwide, Enbridge Inc., Tolko Manitoba Kraft Papers, Simplot Canada Ltd., and Griffin Canada Ltd., supported the Projects. MIPUG noted the benefits of local development, better training for Manitoba workers, increased investment in Manitoba and increased tax revenues.

The Manitoba Federation of Labour supported the Projects, noting the economic benefits they offer all Manitobans, particularly in the North. The MFL said the Projects' unprecedented level of training opportunities and jobs for northern Aboriginal people will help to address poverty in northern communities.

The Thompson Chamber of Commerce commented that basic life-skills training and the ongoing trades training would enhance Thompson's labour pool. The Chamber supported the ongoing training NCN provided to its members and other Participants.

The Northern Manitoba Regional Development Corporation believed that capital development, education and training would benefit the Thompson and NCN areas and the larger region. The Corporation observed that, while there will only be a few on-going permanent positions resulting from the Projects, these jobs should still be considered a benefit.

North Central Development noted that the Projects would give northern Manitoba the opportunity to create a new model of community economic development that could provide training, jobs and business opportunities. It stressed that to be real and sustainable, job opportunities must provide for advancement. The representative believed that the Projects present the best and most realistic opportunity to enhance training throughout the region. By creating employment for the North in a meaningful, respectful and sustainable way, it will benefit all northerners and Manitobans.

Chief Clarence Easter, Chemawawin Cree Nation, supported the partnership between NCN and MH as a basis for exploring a new relationship between Aboriginal communities and corporate Canada. Chief Easter stated that the Projects would provide *"better future employment opportunities and quality of life without having to leave home."*

The Northern Association of Community Councils remarked that, once the Projects are completed, those who have received training would have upgraded skills that they can use to provide a better life for themselves and their families.

The Mayor of The Pas commented that the development of hydroelectric resources would provide a major economic stimulus to the North. He said such capital construction projects provide opportunities for training, skill development, employment and business opportunities.

The President of Keewatin Community College said unemployment rates are significantly higher in reserve communities than in urban centres and that the link between employment and social distress is well documented. The Projects present an opportunity to provide residents of communities where there are limited employment opportunities with skills training that could lead to good employment.

The International Brotherhood of Electrical Workers Local 2034 described provisions negotiated with MH to ensure that Aboriginal communities receive education, training and employment for construction and operation of the generation station. It was noted that the biggest pool of employees for all Manitoba employers is the Aboriginal population. The representative commented that while the Projects have pros and cons, the positives far outweigh the negatives due to the joint-venture structure, minimization of flooding, reduction of barriers through education, training and employment of local residents and the inclusion of local communities as stakeholders.

The Swampy Cree Tribal Council questioned whether the employment and business opportunities would be extended to their Tribal Council. The Tribal Council suggested that other First Nations should be allowed to participate in the partnership to spread the training, employment and business opportunities over a wider area in the North.

The Manitoba and Winnipeg Chambers of Commerce identified the main value of the Projects as their impact on both the Manitoba and Winnipeg economies. The Chambers stressed the economic benefits of the Projects in terms of employment opportunities as well as training and business opportunities. The opportunity to create a skilled labour force through education and job training was seen as being key for provincial growth.

A private citizen commented that traditional livelihood of trapping, fishing and hunting can no longer meet the increasing and changing needs of a growing population and economy. Furthermore, northern unemployment and living conditions are at levels that citizens in southern Canada would not tolerate. Another private citizen suggested that NCN members be allowed to invest in existing generation stations and that MH should provide training, education and opportunities to allow members to participate in and receive benefits from conservation measures and alternative technologies.

7.2.3.3.4 Commission Comments and Observations – Socio-Economic Effects

The Commission heard considerable discussion on the issues of employment and training during the public hearing. The Participants expressed concern about the benefits of the Projects to Aboriginal people and northern Manitobans. Lacking confidence that the Projects would benefit First Nations other than NCN, they wanted guaranteed employment. While many of the Presenters expressed optimism about the employment and training opportunities that the Projects would provide, several Presenters expressed concerns based on their experiences with previous hydroelectric projects in northern Manitoba.

The Commission notes that MH/NCN and the construction-trade unions do not view hiring quotas as appropriate elements of a contract. However, alternative mechanisms are required to ensure that Aboriginal people receive required training, that they are given preference in hiring, and that the number of Aboriginal people hired is reasonable in relation to the total population. Retention of Aboriginal workers through effective orientation, cultural awareness and retraining programs should be a priority.

The Commission recognizes that hiring of NCN members over other First Nation members is implicit in agreements signed to date. However, NCN members in South Indian Lake appeared to feel uncertain about their training and employment opportunities. MH/NCN is therefore encouraged to make every effort to communicate information about the training and employment opportunities available to all NCN members. It should further communicate information as to the way in which the benefits from the Projects will be shared.

Employment periods for the Projects are relatively short-term in the career of a construction worker. The Commission is concerned that Aboriginal people, including NCN members, will be unable to secure the experience prior to the construction that will allow them to secure skilled trades positions. MH/NCN should ensure that there is a bridging program to assist NCN members and other Aboriginal people in receiving the required training.

The Commission expects MH to live up to commitments to Aboriginal and northern Manitoban hiring that were made during the hearing. It also trusts that the parties implementing the BNA will respect MH's commitment regarding employment and training and reach an appropriate agreement.

The Commission will be recommending that provision for monitoring training and employment policies on the Project be included in any licence issued for the Projects.

7.2.3.4 Cultural Effects

7.2.3.4.1 MH/NCN Position – Cultural Effects

In the EIS, MH/NCN described culture as *"a composition of values, beliefs, perceptions, principles, traditions and world views that are superimposed on one another and are perpetuated through the language and kinship system of a distinct group of people."* It noted that culture can be manifested in the way people do things and the way they think. Culture was also described by MH/NCN as *"the fabric of human existence and the source of one's identity."* The EIS used the following nine indicators to examine the effects of the Projects on culture: language, traditional knowledge, cultural practices, health and wellness, worldviews, kinship, leisure, law and order, and cultural products.

MH/NCN concluded that the Generation Project would have both positive and negative socio-economic effects on the people of the local region. By virtue of their proximity to the Project, ongoing traditional use of the area, and participation as a potential partner, it was expected that the greatest effects would be felt by the people of Nelson House and the Nelson House Northern Affairs Community. For the people of South Indian Lake, MH/NCN expected the effects of the Project would be limited to employment and business opportunities. Specific cultural effects included reduced opportunities to speak Cree, loss of interest in collecting and preserving TSK, loss of Taskinigup and Wuskwatim Falls, and reduced concerns about effects on important ceremonial sites. NCN has undertaken ceremonies at the sites that it has identified as important and will continue to do so.

MH/NCN predicted that project construction activities might temporarily disrupt traditional resource use in areas immediately adjacent to transmission-line rights-of-way. MH/NCN did not expect the transmission lines to have lasting effects on trapping, hunting and berry-picking or on those wishing to pursue traditional lifestyles. However, it is possible that harvesting might increase as a result of access created by the cleared rights-of-way, which may have both adverse and beneficial effects. The residual effects of construction and operation of the transmission lines were determined to be insignificant.

MH/NCN submitted that measures have been identified to mitigate adverse effects on the culture of NCN members and other Aboriginal people living primarily at Nelson House. This includes the establishment of a community-based NCN Culture and Heritage Resource Management Committee to address cultural changes. MH/NCN predicted that because the Transmission Project would have limited effects on land and resource uses and heritage resources and because its planning had incorporated TSK and WSK, it would not have any effects on culture.

7.2.3.4.2 Participant Positions – Cultural Effects

Community Association of South Indian Lake

CASIL requested that MH/NCN and its consultants hold community workshops in South Indian Lake to explain the Projects, document CASIL's concerns, utilize local and traditional knowledge, and demonstrate how MH/NCN will mitigate any residual cultural effects.

Pimicikamak Cree Nation

PCN said they now live in a climate of disease and the environment is dying. Referring to a MH/NCN statement that Wuskwatim could add four inches in water level changes at Cross Lake and Jenpeg, they submitted that the process seemingly ignores PCN's rights and interests. PCN stressed that: *"Pimicikamak lands, water and people cannot bear any further exacerbation of the devastating harms that are already occurring as a result of the existing hydro system. One more inch in water fluctuation is too much – when added to the change in feet already occurring."* If one more inch was forced on the community, the Commission was told that the PCN livelihoods, culture, and mental and physical health would further crumble.

The Projects did not fit with the cultural values associated with sustainable development, which PCN said means healing, allowing people to sustain themselves and Mother Earth as the Creator meant for them to do. It was explained that it also means healing the lands, waters and people to the maximum possible extent. This would allow them to end the climate of fear and death, and find once again a climate of respect, trust and health.

Manitoba Métis Federation

The MMF undertook a series of workshops in northern Manitoba to obtain the thoughts of the Métis people affected by past and current hydroelectric developments and to determine their concerns and hopes for the Projects. Based on the workshop results, the MMF reported that the Métis Nation within Manitoba believe that: 1) their lands and resources have been and continue to be affected by MH projects, 2) their communal governance system has been ignored and/or improperly engaged in the consultation process, and 3) the Projects will lead to a further erosion of their culture.

The MMF submitted that the EIS is deficient with respect to the effects on the Métis and there is insufficient information to make any findings on the effects of the Projects on the Métis culture, and that the deficiencies must form part of the Commission's recommendations.

O-Pipon-Na-Piwin Cree Nation

OPCN said the environmental, culture and socio-economic setting in South Indian Lake, which they hold to be distinct from NCN, is not accurately portrayed in the EIS. They stated that an adequate baseline needed to be established to allow proper monitoring of their commercial fishery, other traditional harvesting and culture. They needed the socio-economic baseline to be established to enable adequate monitoring. To accomplish this, specific TSK from each community must be incorporated and proper mitigation and monitoring implemented.

7.2.3.4.3 Presenters Positions – Cultural Effects

A resident of South Indian Lake said that community members have been forced to move away from the community, separating them from their family, culture and traditional livelihood. Several NCN members mentioned that trapping, fishing and hunting can no longer meet the increasing and changing needs of a growing population and economy, and that a long-term source of revenue is needed that will not destroy their culture.

Mr. William Anderson, from Granville Lake, explained that the term for a Cree person is, in the Cree dialect spoken at Granville Lake, *Ethinew*, and the Cree term for the connectedness to and being at one with the land is *Ethineen*. For a Cree person this connection is fostered and developed from early childhood as it is passed down from the ancestors. Mr. Anderson explained that *Ethineen* is significant when referring to social effects of hydroelectric development on the Cree people of Granville Lake. He spoke in particular of the internal turmoil this development has had on the people who use the affected areas for the purposes of cultural development, hunting, fishing and trapping, recreation, commercial purposes and travel.

7.2.3.4.4 Commission Comments and Observations – Cultural Effects

The Commission accepts that the direct effects of the Projects on culture are adequately reflected for the Nelson House RMA. However, it is concerned that limited attention appears to have been paid to potential indirect affects that extend beyond the Nelson House RMA and may exist over a longer time frame. The Commission believes that indirect effects of the Projects may be viewed to be adverse, particularly outside the Nelson House RMA. This may be the case for South Indian Lake, where community members said their concerns were not addressed in a manner similar to those of Nelson House.

The Commission agrees that the effects of the Projects on the Métis culture were not assessed in the EIS based on consultation with the MMF. However, it is encouraged that the Government of Manitoba is overseeing cooperative efforts between MH/NCN and the MMF.

7.2.4 Conclusion and Recommendations

The Commission recognizes that the proposed low-head design, small flooded area and modified run-of-the-river operation of the Generation Project, routing for the Transmission Project, the use of both TSK and WSK, and the partnership arrangement between MH and NCN all serve to reduce the overall environmental effect of the Projects. It also appreciates that mitigation measures and follow-up actions proposed in the EIS documents address project-specific environmental effects.

The Commission believes that the mitigation measures and follow-up actions proposed by MH/NCN will serve to address predicted environmental effects, manage residual effects, and identify unforeseen effects of the Projects. The use of environmental protection plans to implement mitigation, follow-up and other requirements such as licence terms and conditions are viewed to be important to protect the environment. Reporting on the plans will also serve to hold MH/NCN accountable to commitments made in the EIS documents and the public hearing, and to improve the effectiveness of environmental assessments on future hydroelectric generation and transmission projects.

The recommendations in this section of the report are divided into two categories:

- Licensing recommendations
- Consultation recommendations

7.2.4.1 Licensing Recommendations

The Commission is recommending that licenses under *The Environment Act* be granted for both projects, subject to specific licensing requirements. The recommendation for the Generation Projects has three categories of requirements:

- Hydrological requirements
- Environmental protection plan requirements
- Employment/Training requirements

The recommendation for the Transmission Project has two categories of requirements:

- Environmental protection plan requirements
- Employment/Training requirements

The Generation Project

Recommendation 7.1

The Clean Environment Commission recommends that:

A licence under *The Environment Act* for the Generation Project be granted, subject to the following terms and conditions, which are to be included in the Project licence:

A. Hydrological Requirements

Construction and operation of the Generation Project be subject to the following:

- A nominal forebay water level elevation of 234.0 m asl.
- Maximum permissible daily flow change through the generation station of 330 m^3/s under normal operation and 440 m^3/s under temporarily modified operation.
- Maximum daily drawdown of the immediate forebay under normal operating conditions of 0.13 m.
- Maximum daily drawdown of Wuskwatim Lake under normal operations of 0.08 m.
- Operation in accordance with all existing licenses and agreements for the Churchill-Burntwood waterway system and Lake Winnipeg Regulation (LWR).
- Minimum forebay water level under abnormal or emergency operation of 233.0 m asl.
- Immediate notification of the regulator of any operation under emergency mode and the resulting flow changes, and the magnitude of upstream and downstream water-level fluctuations.
- Frequent reporting to the regulator of information relating to pertinent generation station operations including, but not limited to, flows through the station, water spilled, forebay water levels, emergency operation, upstream and downstream water-level fluctuations, and any deviation in operation and water-level fluctuations from that predicted in the licensing applications for the Projects. This information should be readily and easily available to the public.
- Regular reporting of pertinent information with respect to the operation of the Churchill River Diversion (CRD) and LWR and any effect resulting from station operations. This should include a comparison to effects predicted in

the licensing applications for the Projects. This information should be readily and easily available to the public.

B. Environmental Protection Plan requirements

The Generation Station, Construction Camp, and Access Road environmental protection plans (EPP) proposed by Manitoba Hydro and Nisichawayasihk Cree Nation for the Generation Project be incorporated in the licence.

1. The licence stipulate that the EPP require mitigation, monitoring, and reporting on environmental effects, during construction and operation of the Project, on valued environmental components (VECs) and other indicators of change using Traditional Scientific Knowledge (TSK) and Western Scientific Knowledge (WSK) to:

- document evolving baseline conditions and provide reference information for future hydroelectric developments
- predict whether established thresholds will be exceeded and take action to prevent exceedences
- determine thresholds for VECs, where such thresholds are not already established
- assess the accuracy of the assessments with respect to environmental effect identification and measurement
- evaluate the effectiveness of mitigation measures for the assessment of future hydroelectric developments
- measure residual environmental effects and cumulative environmental effects and confirm the determinations of insignificant project and cumulative effects
- verify predictions in the Environmental Impact Statement (EIS) documents and re-evaluate significance if predictions cannot be verified
- provide periodic reports on the effects of the Projects on enduring features, biodiversity, ecological integrity and sustainability.

2. Specific mitigation, monitoring, and reporting should focus on:

- the rate of shoreline erosion of Wuskwatim Lake on an ongoing basis until rates of erosion return to pre-CRD rates
- concentration and downstream extent of sediment transport after completion of construction of the Project until total sediments approach pre-CRD levels
- riverbank erosion downstream from Wuskwatim Lake along the Burntwood River during construction and for a reasonable period of time after. Additional mitigation should be implemented as necessary to control the rate of erosion
- concentration and downstream extent of TSS in the Burntwood and lower Nelson rivers on a regular basis so that up-to-date baseline reference data are available at the time of commencement of construction of the Generation Project
- sediment transport on a regular basis during the construction period to determine the effects on water quality and the extent of downstream movement of these sediments. Monitoring should be more frequent during cofferdam construction and removal.
- woodland caribou population, distribution and behaviour during construction and operation

- fish production in Wuskwatim Lake and the region to verify the prediction that the Generation Project will result in an increase in fish production. The investigation should monitor fish harvests in Wuskwatim Lake in connection with that investigation.
- integrity of protected areas during construction and operation
- greenhouse-gas emissions and their effects during construction and operation.

3. The EPPs should incorporate:

- sustainability indicators for biophysical, socio-economic and cultural conditions
- an adaptive approach to environmental monitoring
- the principles and guidelines of sustainable development, taking into consideration the holistic view of sustainable development.

4. Manitoba Hydro and Nisichawayasihk Cree Nation should be required to:

- report on the implementation of environmental protection plans annually, and to ensure that such reports are readily and easily accessible to stakeholders and to the general public.
- document the application of TSK during construction and operation of the Project.

5. Manitoba Hydro and Nisichawayasihk Cree Nation should also be required to implement the following monitoring programs that it has proposed to federal regulators:

- Fish Habitat Compensation Plan monitoring program
- Aquatic Effects Monitoring Program
- Sediment Management Plan monitoring program.

C. Employment/Training requirements

The licence should require Manitoba Hydro and Nisichawayasihk Cree Nation to:

- monitor and report annually on First Nations, other Aboriginal people and northern Manitoba hiring for the Generation Project to Manitoba Advanced Education and Training. The results should also be published in Manitoba Hydro's annual report. The reports should also include results of the effectiveness of the training, life-skills and on-site counselling programs.
- include Manitoba Hydro's employment and training terms and conditions in contract specifications and operational procedures for the Generation Project. The contracts and procedures should be audited by Manitoba Advanced Education and Training and the results should be readily available to the public.

Transmission Project

Recommendation 7.2

The Clean Environment Commission recommends that:

A licence under *The Environment Act* for the Transmission Project be granted, subject to the following conditions, which are to be included in the licence:

A. Environmental Protection Plan requirements

The Wuskwatim to Birchtree transmission line, the Wuskwatim to Herblet Lake Station transmission line, and the Herblet Lake Station to Rall's Island Station transmission line environmental protection plans (EPP) proposed by Manitoba Hydro and Nisichawayasihk Cree Nation for the Transmission Project be incorporated in the licence.

1. The licence stipulate that the EPP require mitigation, monitoring, and reporting on environmental effects, during construction and operation of the Project, on valued environmental components (VECs) and other indicators of change using Traditional Scientific Knowledge (TSK) and Western Scientific Knowledge (WSK) to:

- document evolving baseline conditions and provide reference information for future hydroelectric developments
- predict whether established thresholds will be exceeded and take action to prevent exceedences
- determine thresholds for VECs, where such thresholds are not already established
- assess the accuracy of the assessments with respect to environmental effect identification and measurement
- evaluate the effectiveness of mitigation measures for the assessment of future hydroelectric developments
- measure residual environmental effects and cumulative environmental effects and confirm the determinations of insignificant project and cumulative effects
- verify predictions in the Environmental Impact Statement (EIS) documents and re-evaluate significance if predictions cannot be verified
- provide periodic reports on the effects of the Projects on enduring features, biodiversity, ecological integrity and sustainability.

2. Specific mitigation, monitoring, and reporting should focus on:

- woodland caribou population, distribution and behaviour during construction and operation
- integrity of protected areas during construction and operation
- greenhouse-gas emissions and their effects during construction and operation.

3. The EPPs should incorporate:

- sustainability indicators for biophysical, socio-economic and cultural conditions
- an adaptive approach to environmental monitoring
- the principles and guidelines of sustainable development, taking into consideration the holistic view of sustainable development.

4. Manitoba Hydro and Nisichawayasihk Cree Nation should be required to:

- report on the implementation of environmental protection plans annually and to ensure that such reports are readily and easily accessible to stakeholders and to the general public.
- document the application of TSK during construction and operation of the Project.

B. Employment/Training Requirements

The licence should require Manitoba Hydro and Nisichawayasihk Cree Nation to:

- monitor and report annually on First Nations, other Aboriginal people and northern Manitoba hiring for the Transmission Project to Manitoba Advanced Education and Training. The results should also be published in Manitoba Hydro's annual report. The reports should also include results of the effectiveness of the training, life-skills and on-site counselling programs.

- include Manitoba Hydro's employment and training terms and conditions in contract specifications and operational procedures for the Transmission Project. The contracts and procedures should be audited by Manitoba Advanced Education and Training and the results should be readily available to the public.

7.2.4.2 Consultation Recommendations

Recommendation 7.3
The Clean Environment Commission recommends that:

Manitoba Hydro consult with the Manitoba Metis Federation on matters of mutual interest pertaining to the Projects. Progress on these consultations should be included in the public involvement plan for the Projects and reported on by Manitoba Hydro and Manitoba Hydro and Nisichawayasihk Cree Nation along with other aspects of the plan.

Recommendation 7.4
The Clean Environment Commission recommends that:

Manitoba Hydro and Nisichawayasihk Cree Nation and consult with Mosakahiken Cree Nation about their concerns with respect to transmission routes.

Recommendation 7.5
The Clean Environment Commission recommends that:

Manitoba Hydro, Nisichawayasihk Cree Nation and the Community Association of South Indian Lake renew their efforts to resolve the issues that stand between them in regard to the Generation Project and other related matters.

7.3 The weight of the past: CRD, LWR, and the AFP

The Commission heard repeated expressions of dissatisfaction, anger and mistrust from First Nations, other Aboriginal communities and the public throughout the hearing about the continuing adverse effects of the CRD, LWR, the AFP, the outstanding compensation claims for damages, and the ongoing hardships imposed on many of the Aboriginal people in northern Manitoba. The construction of CRD in the 1970s along with subsequent implementation of the AFP diverted up to 35,000 cfs down the Burntwood River. Local traditional economies and communities were seriously undermined as a result. While recognizing that the CRD/AFP is outside the mandate for this hearing on the Projects, the Commission notes that the Wuskwatim Projects would not have been possible without the massive diversion of water associated with the CRD/AFP. The Commission also notes that the CRD and LWR have been operating for nearly three decades with interim licences.

The Commission believes it would not be appropriate to ignore the issues related to the CRD, LWR, and the AFP that were raised at the hearing and continue to dominate the lives of many northerners. This section of the report documents their comments and concludes with a recommendation that MH move quickly to apply for appropriate licensing of these operations.

7.3.1 Participant Comments on CRD, LWR and AFP

Community Association of South Indian Lake

CASIL spoke about the history of commercial fishing on Southern Indian Lake and the effects of the CRD on the commercial fishery and the people in the community in the 1970s. In the 1980s, the AFP destroyed fish-spawning habitat and increased sedimentation in Southern Indian Lake, resulting in a further decline in commercial and domestic fish productivity.

CASIL raised concerns that the minimum and maximum authorized regulated levels of Southern Indian Lake had been exceeded. While the interim license granted under *The Water Power Act* appears to contemplate situations where the level of Southern Indian Lake may rise above 847 ft asl without stating any maximum level, CASIL is of the opinion that any level over the 847 ft asl (847.5 ft as varied by the AFP) or below 844 ft asl (843 ft asl as varied by the AFP) is a violation of the licence.

CASIL said that the measuring technique employed by MH was not providing accurate information about lake levels.

CASIL said that there had been numerous violations of both *Environment Act* Licence 2327 and the CRD interim licence governing the operation of the Missi Falls structure over the years. They stated that while the Missi Falls control structure was once operated by on-site personnel, this is no longer the case.

CASIL stated that if the Commission recommended in favour of licensing the Projects it would be doing so despite continuing violations of the AFP and CASIL's 1992 compensation agreement with MH.

Time to Respect Earth's Ecosystems/Resource Conservation Manitoba

TREE/RCM questioned MH with respect to the descriptive and licensing aspects of the AFP. Specifically, they requested a brief characterization of the program including what type of license it operated under, how long it has been in existence, and whether there was any kind of formal environmental process prior to the first authorization of the AFP. They also asked if MH intended to request that the CRD interim license be converted to a final license as part of the Generation Project approval process. In addition, they questioned whether the Wuskwatim economics assumed the continuation of the AFP.

O-Pipon-Na-Piwin Cree Nation

OPCN testified that adverse effects caused by CRD and the AFP are not being fully mitigated. They called upon MH and the Government of Manitoba to honour the conditions of the AFP by regulating Southern Indian Lake in such a manner as to minimize adverse effects on their people.

Trap Line No. 18

Trap Line No. 18 is located west of Wabowden and southwest of Thompson in the Wabowden RTA Section 430, adjoining the NCN RMA. The trap line is in a muskeg area with small lakes, creeks and forested patches. To the north of the trap line area water flows north and east into the Burntwood River and Wuskwatim Lake. Water within the trap line area generally flows from north to south by way of Ferguson Creek that flows into the Grass River and then the Burntwood River. An elevated area or height of land separates the two drainage areas.

The Trap Line No. 18 representative stated that the area has undergone significant changes since the 1970s, which he believes to be the result of the construction and operation of CRD. He indicated that there has been extensive flooding on Trap Line No. 18 since 1976. During that period water levels in Ferguson Creek and other creeks in the area have often been 6- to 7-ft above pre-CRD levels. The resulting slush and hanging ice make snowmobile travel difficult in the winter. The representative raised the possibility that the Trap Line No. 18 area was linked to the CRD by an underground river.

Trap Line No. 18 filed a number of statements from individuals familiar with the area supporting their claim of changed water levels and ice conditions in the area since CRD came into operation.

Trap Line No. 18 contended that operation of the CRD has caused destruction to wildlife including caribou, fox, beaver and martin habitat in their traditional trapping area.

Displaced Residents of South Indian Lake

DRSIL spoke about the flooding and ongoing effects on Southern Indian Lake caused by the CRD. They stated that when Southern Indian Lake was flooded, MH assured residents that the resulting damage would be limited and manageable. Neither prediction, they said, has turned out to be accurate.

DRSIL spoke about community life before flooding on Southern Indian Lake. They also spoke of their international reputation for whitefish, which was served in some the finest restaurants in North America. Southern Indian Lake fish harvest information was submitted in support of their arguments. DRSIL contended that the people are now getting sick from eating the fish and drinking the water of Southern Indian Lake.

7.3.2 Presenter Comments and Observations—CRD, LWR, and AFP

Two Presenters in Thompson indicated that, in their opinion, MH has nothing to do with changing water levels in the Trap Line 18 area. They said these water levels have always fluctuated as a result of changes in precipitation and other natural conditions. Furthermore, they stated that hanging ice and slush ice are naturally occurring conditions.

7.3.3 Commission Comments and Observations—CRD, LWR, and AFP

The Commission is aware of CASIL's position that flows or levels outside those prescribed in the interim CRD licence and the AFP authorization are in violation of the licence terms and conditions. It recognizes, however, that in extremely wet periods, it may not be prudent to control Southern Indian Lake levels within the prescribed upper limit. Furthermore, it would not be advisable to make large flow adjustments at Notigi or Missi Falls without taking adequate precautions and providing advance warning to downstream interests. Given the variability of water levels and flows as a result of wind and the difficulty in continuously and precisely adjusting gates to achieve the desired flow, the Commission understands the need for some judgment and understanding in the implementation of the prescribed flows.

The regulation of Southern Indian Lake and the prescribed flows and water levels is outside the scope of the Commission's terms of reference. The Commission does however, urge MH to take all reasonable steps to maintain the level of Southern Indian Lake and, in particular, the outflow from the Missi Falls Control Structure within the terms of the interim licence for the operation of the CRD and licence 2327 under *The Environment Act* for the Churchill weir.

The Commission is aware of CASIL's position that MH's methodology for determining the level of Southern Indian Lake by averaging of the four water level gauges located around Southern Indian Lake as well as the smoothing techniques employed was not providing an accurate measurement of the lake level. It was CASIL's position that not one of the water level gauges could go over or under the prescribed limits in order for MH to be in compliance with their licence.

The Commission notes that the level of large lakes such as Southern Indian Lake vary as a result of wind, waves, and flow as well as from lunar cycles and barometric pressure. While the interim licence for LWR specifies a wind-eliminated level be employed, the CRD interim licence is silent in this regard. However the Commission notes that the NFA requires the use of a "static level" for measuring the level of Southern Indian Lake. This equates to a wind-eliminated level.

The Commission recognizes that the level of large lakes is commonly determined using a wind-eliminated technique and agrees with MH's methodology for measuring the level of Southern Indian Lake.

Topographical maps indicate that Trap Line No. 18 is located in the area of a relatively high ground with ground elevations as high as 290 m asl in some parts of the area. This compares with an average level of Footprint Lake of approximately 242.9 m asl and of Wuskwatim Lake of around 233.6 m asl. The Commission agrees with MH/NCN's position that any flooding and ice problems in the vicinity of Trap Line No. 18 are not caused by operation of the CRD.

The Commission notes that MH was asked whether it intended to apply for final licences for LWR and CRD including the AFP as part of the licensing of the Generation Project. MH indicated that there were still outstanding issues to be resolved before it could apply for final licences but that it was its intention to do so once all outstanding issues were resolved.

Given the intense level of concern exhibited by Participants with regard to the CRD, AFP and LWR, and the time spent considering the effects of these projects, the Commission strongly urges MH to resolve all outstanding issues as expeditiously as possible so that it may apply to the Government of Manitoba for final licences. Hopefully, this process will help to resolve many if not all of the outstanding concerns with respect to the very significant effects of these projects. If these matters can be resolved, it would greatly simplify any further hydroelectric generation licensing applications that MH may bring before the Commission.

7.3.3 CRD, LWR, AFP Recommendations

Recommendation 7.6

The Clean Environment Commission recommends that:

The Government of Manitoba require Manitoba Hydro to resolve all outstanding issues with regard to the Churchill River Diversion, the Augmented Flow Program and Lake Winnipeg Regulation. Following resolution of these issues, Manitoba Hydro should apply for the appropriate final licences for these three operations under *The Environment Act* and *The Water Power Act* as soon as possible.

Recommendation 7.7

The Clean Environment Commission recommends that:

The application for the approval of final licences for Churchill River Diversion, Augmented Flow Program and Lake Winnipeg Regulation should include a review of the terms and conditions, an operational review and any required environmental impact assessments. Clear guidelines should be developed with respect to what constitutes conformance to and/or violation of the terms of the licences.

The Projects and other future developments provide an opportunity to address the effects of past projects and provide for sustainable hydroelectric developments along the Churchill, Burntwood and Nelson rivers that benefit First Nations, other Aboriginal communities and northern Manitoba residents. Furthermore, there are opportunities to protect and preserve cultural values and achieve long-term sustainable development through partnership agreements such as those being pursued by MH/NCN for Wuskwatim and MH and other First Nations for future hydroelectric projects.

The Projects under consideration represent an important step towards realizing such opportunities.

7.4 Improving the Process

The Commission will now turn the discussion to steps that can be taken to strengthen this process. The EIS documents submitted for these projects were the first environmental assessments completed on a major hydroelectric development under *The Environment Act*. Accordingly, the Commission believes that there are opportunities for improvement by both Manitoba Conservation in terms of regulatory requirements and guidance, and MH in terms of approach, methodology and best practices. This is of particular importance in view of the large-scale hydroelectric developments involving potential partnership arrangements with First Nations currently being planned for northern Manitoba.

The Commission believes that requiring higher standards of performance would enhance the practice of environmental assessment in Manitoba and make it more transparent for Manitobans. In this regard, Manitoba should enact environmental assessment legislation, enhance awareness and provide guidance for proponents, consultants and practitioners, and establish protocols for best professional practice that includes use of traditional and local knowledge, selection of appropriate VECs, establishment of baseline conditions, and evaluation of significance in the conduct of environmental assessments. The protocols should reduce uncertainty, enhance effectiveness and improve predictability of future environmental assessments.

The Commission wishes to comment on the following specific issues.

- VECs
- Baseline Conditions
- Thresholds
- Regional planning
- TSK
- Cumulative-effects assessment

In addition, the Commission will be making recommendations based on its comments in section 7.2.2.1.3 (Commission Comments and Observations – Sustainable Development.)

7.4.1 VECs

The Government of Manitoba should develop criteria and procedures to select and describe VECs for environmental assessments that include TSK and WSK approaches. This process needs to fully engage First Nations, other Aboriginal communities and other interested parties.

7.4.2 Baseline Conditions

The Government of Manitoba should document and make available baseline environmental information for air, water and land systems for use by proponents, consultants and practitioners in the conduct of environmental assessments, regional planning and other related initiatives. TSK and WSK approaches should be used to qualify baseline environmental conditions for the assessment of future hydroelectric developments, and to evaluate significance for effective decision-making on development proposals.

Given the studies, investigations, research and monitoring that have been and continue to be carried out as part of the Project review, the Commission believes that it is possible to document baseline conditions for selected biophysical, socio-economic and cultural indicators from pre-CRD conditions to the present and, based on this information, predict future environmental conditions and effects.

7.4.3 Thresholds

The Government of Manitoba should establish measurable thresholds based on scientific and traditional knowledge approaches for representative biophysical, socio-economic and cultural VECs to be used in environmental assessments of future hydroelectric developments.

The Commission believes that an opportunity exists to use thresholds in assessing the incremental effects of sequential development activities such as those resulting from the CRD and AFP, the present Projects and the proposed Gull/Keeyask and Conawapa projects. Each VEC or critical environmental component has a threshold that can be defined, measured and monitored. In this way, potential exceedences can be predicted in advance instead of monitoring their occurrence. The Commission also believes that both WSK and TSK can be used to establish thresholds beyond which change is not acceptable and therefore significant.

7.4.4 Regional Planning

The Government of Manitoba should undertake a regional planning initiative in northern Manitoba and on the east side of Lake Winnipeg, to address existing and future hydroelectric and other developments. This should include consideration of existing and future protected areas. In this regard, MH/NCN should continue to cooperate with Manitoba Conservation, First Nations and other Aboriginal communities, environmental organizations and other stakeholders in the implementation of Manitoba's protected areas initiative.

A cooperative regional planning approach would be more appropriate to assess the cumulative effects of past, present and future developments in northern Manitoba. The Commission further notes that there is potential for a strategic environmental-assessment approach to future planning and development in northern Manitoba that includes hydroelectric development along with future mining, transportation, infrastructure and related projects.

7.4.5 TSK

In the case of the Projects, TSK did not appear to be used as a factor in the identification of thresholds or the evaluation of significance. To be meaningful and acceptable to NCN members and others, determinations of insignificant environmental effects need to be tested against TSK criteria.

Furthermore, it was not clear whether NCN Elders participated in the evaluation of significance. As noted earlier, the Commission appreciates the MH/NCN statement that they have included both WSK and TSK throughout the EIS documents to describe baseline conditions for the Projects. However, this use is not well documented in the EIS documents. For example, there were no lists of meetings, names of persons attending meetings (i.e. Elders, community members, resource harvesters, consultants and others), accounting of concerns raised, actions taken and outstanding issues in the EIS documents. While MH/NCN argued that this was necessary to protect confidentiality, the Commission does not accept this argument as valid in all cases.

The Commission believes that there would have been greater use and greater documentation of TSK use if the terms Aboriginal traditional knowledge, traditional ecological knowledge, traditional knowledge, Aboriginal knowledge and other variations had been defined in the EIS Guidelines and used appropriately. The definitions should also recognize the Cree worldview and First Nations should be involved to confirm that the definitions are acceptable.

The Commission believes that protocols for the respectful acquisition, application and management of TSK need to be developed by Manitoba First Nations and other Aboriginal representatives with Manitoba Conservation. The protocols should include requirements for data-sharing agreements and protected uses of TSK. Best practice guidelines should then be developed for proponents and environmental assessment practitioners on the inclusion of TSK in environmental assessments conducted in Manitoba. The guidelines should specify how both TSK and WSK should be used together in the identification, assessment and mitigation of environmental effects, and in the evaluation of significance for major development projects.

7.4.6 Cumulative-effects assessment

It is the Commission's view that high-quality cumulative-effects assessments would

- assess effects over a larger (that is, regional) area that may cross jurisdictional boundaries
- assess effects during a longer period of time into the past and future
- consider effects on VECs due to interactions with other actions, and not just the effects of the single action under review
- include other past, existing and future (for example, reasonably foreseeable) actions
- evaluate significance in consideration of other than just local, direct effects.

Absorbing the adverse effects of the CRD and AFP in any future project's baseline conditions would have the effect of accepting the adverse effects and precluding possible remediation, restoration and other mitigative actions. As a result, opportunities to rehabilitate areas damaged by the CRD and AFP will not be fully explored

Similarly, the Commission believes that these environmental damages, including greenhouse-gas production from flooding on Southern Indian Lake and other water bodies, should be included in future environmental and economic assessments.

The fact that these measures were not taken as a part of the assessment related to the current Projects is unfortunate. The

Commission expects broader-cumulative impact studies in the future.

The Commission is also of the opinion that there may be some potential for cumulative environmental effects of the Projects on protected areas when the effects of other projects and activities in the region are considered. The Commission accepts that such matters are beyond the control of MH/NCN but believes that MH and its future partners should consider these matters when planning future hydroelectric developmental and associated transmission facilities.

7.4.7 Improving the Process Recommendations

Recommendation 7.8

The Clean Environment Commission recommends that:

The practice of environmental assessment in Manitoba be enhanced by requiring higher standards of performance. In this regard, the Government of Manitoba should

- enact environmental assessment legislation,
- provide guidance for proponents, consultants and practitioners,
- establish protocols for best professional practice that includes cumulative-effects assessment.

The process should include use of traditional scientific knowledge, selection of appropriate Valued Environmental Components (VECs), establishment of baseline conditions, and establishment of thresholds in the conduct of environmental assessments. The protocols should reduce uncertainty, enhance effectiveness and improve predictability of future environmental assessments.

Recommendation 7.9

The Clean Environment Commission recommends that:

Manitoba Hydro develop a climate-change policy consistent with provincial and national climate change policies and guidance, and apply the policy in the assessment of future hydroelectric developments. Preparation of a sustainable-development strategy in accordance with provisions of *The Sustainable Development Act* would be an essential element of such a policy.

Recommendation 7.10

The Clean Environment Commission recommends that:

Future environmental impact statement submissions for large-scale hydroelectric developments should directly address the Government of Manitoba's *Sustainable Development Code* and its *Financial Management Guidelines*. The submissions should also develop appropriate sustainability indicators for use in identifying and assessing environmental effects, and conducting environmental monitoring.

8. Recommendations

Recommendation 6.1

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric projects be required to include an analysis of all risks, including business risks, and, where possible, the risks should be quantified.

Recommendation 6.2

The Clean Environment Commission recommends that:

The Government of Manitoba grant the Public Utilities Board jurisdiction to review, on an ongoing basis, as part of Manitoba Hydro's future General Rate Applications, the actual revenues and costs of the Projects relative to forecast, along with the impact of the Projects on Manitoba Hydro's financial stability and its domestic rates.

Recommendation 6.3

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric development projects be required to include internal-rate-of-return-analyses of the project that have been conducted from both a Project perspective and Manitoba Hydro's corporate perspective.

Recommendation 6.4

The Clean Environment Commission recommends that:

Any future Manitoba Hydro "Need for and Alternatives To" filings for major hydroelectric development projects be required to employ a portfolio approach for assessing resource options. The portfolios should include consideration of hydroelectric sequencing as well as coordinated implementation of other initiatives such as DSM programs and SSE projects.

Recommendation 6.5

The Clean Environment Commission recommends that:

Manitoba Hydro should be required to review its non-utility generation policy and its rate structure to ensure that all possible steps are being taken to promote economic non-utility generation.

Recommendation 7.1

The Clean Environment Commission recommends that:

A licence under *The Environment Act* for the

Generation Project be granted, subject to the following terms and conditions, which are to be *included in the Project licence:*

A. Hydrological Requirements

Construction and operation of the Generation Project be subject to the following:

- A nominal forebay water level elevation of 234.0 m asl.
- Maximum permissible daily flow change through the generation station of 330 m^3/s under normal operation and 440 m^3/s under temporarily modified operation.
- Maximum daily drawdown of the immediate forebay under normal operating conditions of 0.13 m.
- Maximum daily drawdown of Wuskwatim Lake under normal operations of 0.08 m.
- Operation in accordance with all existing licenses and agreements for the Churchill-Burntwood waterway system and Lake Winnipeg Regulation (LWR).
- Minimum forebay water level under abnormal or emergency operation of 233.0 m asl.
- Immediate notification of the regulator of any operation under emergency mode and the resulting flow changes, and the magnitude of upstream and downstream water-level fluctuations.
- Frequent reporting to the regulator of information relating to pertinent generation station operations including, but not limited to, flows through the station, water spilled, forebay water levels, emergency operation, upstream and downstream water-level fluctuations, and any deviation in operation and water-level fluctuations from that predicted in the licensing applications for the Projects. This information should be readily and easily available to the public.
- Regular reporting of pertinent information with respect to the operation of the Churchill River Diversion (CRD) and LWR and any effect resulting from station operations. This should include a comparison to effects predicted in the licensing applications for the Projects. This information should be readily and easily available to the public.

B. Environmental Protection Plan requirements

The Generation Station, Construction Camp, and Access Road environmental protection plans (EPP) proposed by Manitoba Hydro and Nisichawayasihk Cree Nation for the Generation Project be incorporated in the licence.

1. The licence stipulate that the EPP require mitigation, monitoring, and reporting on environmental effects, during construction and operation of the Project, on valued environmental components (VECs) and other indicators of change using Traditional Scientific Knowledge (TSK) and Western Scientific Knowledge (WSK) to:

- document evolving baseline conditions and provide reference information for future hydroelectric developments
- predict whether established thresholds will be exceeded and take action to prevent exceedences
- determine thresholds for VECs, where such thresholds are not already established
- assess the accuracy of the assessments with respect to environmental effect identification and measurement
- evaluate the effectiveness of mitigation measures for the assessment of future hydro-

electric developments

- measure residual environmental effects and cumulative environmental effects and confirm the determinations of insignificant project and cumulative effects
- verify predictions in the Environmental Impact Statement (EIS) documents and re-evaluate significance if predictions cannot be verified
- provide periodic reports on the effects of the Projects on enduring features, biodiversity, ecological integrity and sustainability.

2. Specific mitigation, monitoring, and reporting should focus on:

- the rate of shoreline erosion of Wuskwatim Lake on an ongoing basis until rates of erosion return to pre-CRD rates
- concentration and downstream extent of sediment transport after completion of construction of the Project until total sediments approach pre-CRD levels
- riverbank erosion downstream from Wuskwatim Lake along the Burntwood River during construction and for a reasonable period of time after. Additional mitigation should be implemented as necessary to control the rate of erosion
- concentration and downstream extent of TSS in the Burntwood and lower Nelson rivers on a regular basis so that up-to-date baseline reference data are available at the time of commencement of construction of the Generation Project
- sediment transport on a regular basis during the construction period to determine the effects on water quality and the extent of downstream movement of these sediments. Monitoring should be more frequent during cofferdam construction and removal.
- woodland caribou population, distribution and behaviour during construction and operation
- fish production in Wuskwatim Lake and the region to verify the prediction that the Generation Project will result in an increase in fish production. The investigation should monitor fish harvests in Wuskwatim Lake in connection with that investigation.
- integrity of protected areas during construction and operation
- greenhouse-gas emissions and their effects during construction and operation.

3. The EPPs should incorporate:

- sustainability indicators for biophysical, socio-economic and cultural conditions
- an adaptive approach to environmental monitoring
- the principles and guidelines of sustainable development, taking into consideration the holistic view of sustainable development.

4. Manitoba Hydro and Nisichawayasihk Cree Nation should be required to:

- report on the implementation of environmental protection plans annually, and to ensure that such reports are readily and easily accessible to stakeholders and to the general public.
- document the application of TSK during construction and operation of the Project.

5. Manitoba Hydro and Nisichawayasihk Cree Nation should also be required to implement the following monitoring programs that it

has proposed to federal regulators:

- Fish Habitat Compensation Plan monitoring program
- Aquatic Effects Monitoring Program
- Sediment Management Plan monitoring program.

C. Employment/Training requirements

The licence should require Manitoba Hydro and Nisichawayasihk Cree Nation to:

- monitor and report annually on First Nations, other Aboriginal people and northern Manitoba hiring for the Generation Project to Manitoba Advanced Education and Training. The results should also be published in Manitoba Hydro's annual report. The reports should also include results of the effectiveness of the training, life-skills and on-site counselling programs.
- include Manitoba Hydro's employment and training terms and conditions in contract specifications and operational procedures for the Generation Project. The contracts and procedures should be audited by Manitoba Advanced Education and Training and the results should be readily available to the public.

Recommendation 7.2

The Clean Environment Commission recommends that:

A licence under *The Environment Act* for the Transmission Project be granted, subject to the following conditions, which are to be included in the licence:

A. Environmental Protection Plan requirements

The Wuskwatim to Birchtree transmission line, the Wuskwatim to Herblet Lake Station transmission line, and the Herblet Lake Station to Rall's Island Station transmission line environmental protection plans (EPP) proposed by Manitoba Hydro and Nisichawayasihk Cree Nation for the Transmission Project be incorporated in the licence.

1. The licence stipulate that the EPP require mitigation, monitoring, and reporting on environmental effects, during construction and operation of the Project, on valued environmental components (VECs) and other indicators of change using Traditional Scientific Knowledge (TSK) and Western Scientific Knowledge (WSK) to:

- document evolving baseline conditions and provide reference information for future hydroelectric developments
- predict whether established thresholds will be exceeded and take action to prevent exceedences,
- determine thresholds for VECs, where such thresholds are not already established
- assess the accuracy of the assessments with respect to environmental effect identification and measurement
- evaluate the effectiveness of mitigation measures for the assessment of future hydroelectric developments
- measure residual environmental effects and cumulative environmental effects and confirm the determinations of insignificant project and cumulative effects
- verify predictions in the Environmental Impact Statement (EIS) documents and re-evaluate significance if predictions cannot be

verified

- provide periodic reports on the effects of the Projects on enduring features, biodiversity, ecological integrity and sustainability.

2. Specific mitigation, monitoring, and reporting should focus on:

- woodland caribou population, distribution and behaviour during construction and operation
- integrity of protected areas during construction and operation
- greenhouse-gas emissions and their effects during construction and operation.

3. The EPPs should incorporate:

- sustainability indicators for biophysical, socio-economic and cultural conditions
- an adaptive approach to environmental monitoring
- the principles and guidelines of sustainable development, taking into consideration the holistic view of sustainable development.

4. Manitoba Hydro and Nisichawayasihk Cree Nation should be required to:

- report on the implementation of environmental protection plans annually and to ensure that such reports are readily and easily accessible to stakeholders and to the general public.
- document the application of TSK during construction and operation of the Project.

B. Employment/Training Requirements

The licence should require Manitoba Hydro and Nisichawayasihk Cree Nation to:

- monitor and report annually on First Nations, other Aboriginal people and northern Manitoba hiring for the Transmission Project to Manitoba Advanced Education and Training. The results should also be published in Manitoba Hydro's annual report. The reports should also include results of the effectiveness of the training, life-skills and on-site counselling programs.
- include Manitoba Hydro's employment and training terms and conditions in contract specifications and operational procedures for the Transmission Project. The contracts and procedures should be audited by Manitoba Advanced Education and Training and the results should be readily available to the public.

Recommendation 7.3

The Clean Environment Commission recommends that:

Manitoba Hydro consult with the Manitoba Metis Federation on matters of mutual interest pertaining to the Projects. Progress on these consultations should be included in the public involvement plan for the Projects and reported on by Manitoba Hydro and Manitoba Hydro and Nisichawayasihk Cree Nation along with other aspects of the plan.

Recommendation 7.4

The Clean Environment Commission recommends that:

Manitoba Hydro and Nisichawayasihk Cree Nation and consult with Mosakahiken Cree Nation about their concerns with respect to transmission routes.

Recommendation 7.5

The Clean Environment Commission recommends that:

Manitoba Hydro, Nisichawayasihk Cree Nation and the Community Association of South Indian Lake renew their efforts to resolve the issues that stand between them in regard to the Generation Project and other related matters.

Recommendation 7.6

The Clean Environment Commission recommends that:

The Government of Manitoba require Manitoba Hydro to resolve all outstanding issues with regard to the Churchill River Diversion, the Augmented Flow Program and Lake Winnipeg Regulation. Following resolution of these issues, Manitoba Hydro should apply for the appropriate final licences for these three operations under *The Environment Act* and *The Water Power Act* as soon as possible.

Recommendation 7.7

The Clean Environment Commission recommends that:

The application for the approval of final licences for Churchill River Diversion, Augmented Flow Program and Lake Winnipeg Regulation should include a review of the terms and conditions, an operational review and any required environmental impact assessments. Clear guidelines should be developed with respect to what constitutes conformance to and/or violation of the terms of the licences.

Recommendation 7.8

The Clean Environment Commission recommends that:

The practice of environmental assessment in Manitoba be enhanced by requiring higher standards of performance. In this regard, the Government of Manitoba should

- enact environmental assessment legislation,
- provide guidance for proponents, consultants and practitioners,
- establish protocols for best professional practice that includes cumulative-effects assessment.

The process should include use of traditional scientific knowledge, selection of appropriate Valued Environmental Components (VECs), establishment of baseline conditions, and establishment of thresholds in the conduct of environmental assessments. The protocols should reduce uncertainty, enhance effectiveness and improve predictability of future environmental assessments.

Recommendation 7.9

The Clean Environment Commission recommends that:

Manitoba Hydro develop a climate-change policy consistent with provincial and national climate change policies and guidance, and apply the policy in the assessment of future hydroelectric developments. Preparation of a sustainable-development strategy in accordance with provisions of *The Sustainable Development Act* would be an essential element of such a policy.

Recommendation 7.10

The Clean Environment Commission recommends that:

Future environmental impact statement submissions for large-scale hydroelectric developments should directly address the Government of Manitoba's *Sustainable Development Code* and its *Financial Management Guidelines*. The submissions should also develop appropriate sustainability indicators for use in identifying and assessing environmental effects, and conducting environmental monitoring.

Appendix A

Terms of Reference: Clean Environment Commission Public Hearing on the Manitoba Hydro Wuskwatim Proposals

Background

On December 7, 2001, Manitoba Conservation received separate *Environment Act* Proposals from MH respecting the proposed Wuskwatim Generating Station and associated transmission facilities (Wuskwatim Proposals). A cooperative provincial/federal review of the proposals is underway in accordance with the Canada-Manitoba Agreement on Environmental Assessment Cooperation. The review includes the preparation of an Environmental Impact Statement in accordance with Guidelines prepared by Manitoba and Canada and finalized after a public consultation process led by the Clean Environment Commission. As well, a Comprehensive Study Report prepared pursuant to requirements of the *Canadian Environmental Assessment Act* will be prepared. It was also decided that the review would include a public hearing of the Clean Environment Commission (the Commission).

Mandate of the Hearings

The Commission shall conduct an integrated public hearing, in appropriate locations in Winnipeg and northern Manitoba as determined by the Commission, to consider:

- Firstly, the justification, need for and alternatives to the Wuskwatim Proposals; and
- Secondly, the potential environmental, socio-economic and cultural effects, of the construction and operation of the Wuskwatim Proposals.

The Commission shall conduct the hearing in general accordance with its Process Guidelines Respecting Public Hearings which include procedures for Pre-Hearing Meetings or Conferences and Proprietary Information.

Following the public hearing the Commission shall provide a report to the Minister of Conservation pursuant to Section 7(3) of *The Environment Act*.

The Commission may, at any time, request that the Minister of Conservation review or clarify these Terms of Reference.

Scope of the Review

For the justification, need for and alternatives to the Wuskwatim Proposals component of the hearing, the Commission shall:

- Consider whether all alternative resource options have been considered and whether the Wuskwatim Proposals have been selected on reasonable grounds, including economic viability as an export market driven project and relevant technical factors. The review of economic viability shall consider the Wuskwatim Proposals in their entirety.

- Include the effect, if any, of the Wuskwatim Proposals on Manitoba Hydro customer rates and the Corporation's financial stability. The partnership between the Nisichawayasihk Cree Nation and Manitoba Hydro and the associated arrangements for such partnership are to be described to the degree such information is required to understand the financial analysis.
- Give consideration, at a conceptual level, to the environmental, socio-economic and cultural effects of the Wuskwatim Proposals relative to available alternative resources.
- Consider Manitoba Hydro's electricity generation capability, market prospects and risks as they pertain to the Wuskwatim Proposals including:
  - load growth in export jurisdictions;
  - energy supply situation in the export jurisdictions; and
  - energy pricing trends and industry restructuring.

For the potential environmental, socio-economic, and cultural effects of the Wuskwatim Proposals component of the hearing, the Commission shall consider the Environmental Impact Statement, and public concerns, and with consideration of the evidence received on the justification, need for, and alternatives to the Wuskwatim Proposals, provide a recommendation on:

- Whether Environment Act licences should be issued to Manitoba Hydro for the Wuskwatim Proposals.

Should the Commission recommend the issuance of *Environment Act* licences for the Wuskwatim Proposals, then appropriate recommendations should be provided respecting:

- Measures proposed to mitigate any adverse environmental, socio-economic, and cultural effects resulting from the Wuskwatim Proposals and where appropriate, to manage any residual adverse effects; and
- Future monitoring and research that may be recommended in relation to the Wuskwatim Proposals.

The Clean Environment Commission's recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in Sustainable Development Strategy for Manitoba.

Appendix B

Participants/Presenters

Name	**Affiliation**
Adams, Ken	Manitoba Hydro/Nisichawayasihk Cree Nation
Anderson, Ellen	Manitoba Wildlands/Canadian Nature Federation
Anderson, Jessie	Fox Lake Cree Nation
Anderson, Michael	Manitoba Keewatinook Ininew Okimowin
Anderson, William	Granville Lake
Angus, David	Winnipeg and Manitoba Chambers of Commerce
Atkins, Bob	Manitoba Hydro/Nisichawayasihk Cree Nation
Baker, Chris	O-Pinon-Na-Piwin Cree Nation
Baker, Leslie	Granville Lake
Bayne, Erin	Manitoba Wildlands/Canadian Nature Federation
Beardy, Elizabeth	Fox Lake Cree Nation
Bedford, Doug	Manitoba Hydro/Nisichawayasihk Cree Nation
Benoit, Al	Manitoba Metis Federation
Benoit, Dan	Manitoba Metis Federation
Bighetty, Pascal	Swampy Cree Tribal Council
Bos, Anthony	Keewatin Community College
Boyd, Garnet	International Brotherhood of Electrical Workers
Bruyere, Caroline	Sagkeeng First Nation
Bunn, Amissa	Private
Campbell, Jerry Ron	Mosakahiken Cree Nation
Chartrand, David	Manitoba Metis Federation
Ciekiewicz, Allan	Private
Comaskey, Bill	City of Thompson
Cormie, David	Manitoba Hydro/Nisichawayasihk Cree Nation
Davies, Stuart	Manitoba Hydro/Nisichawayasihk Cree Nation
Desjarlais, Norval	Manitoba Metis Federation
Dick, Samson	Fox Lake Cree Nation
Duboff, Neil	Community Association of South Indian Lake

Dysart, Angus	Displaced Residents of South Indian Lake
Dysart, Leslie	Community Association of South Indian Lake
Dysart, Sam	Nisichawayasihk Cree Nation
Dysart, William	Community Association of South Indian Lake
Easter, Clarence	Chemawawin First Nation
Fitzner, Fred	Wabowden Trappers Association
Fleming, Alex	Manitoba Hydro/Nisichawayasihk Cree Nation
Flett, Joshua	Displaced Residents of South Indian Lake
Fortin, Keith	Private
Garrick, Henry	Wabowden Trappers Association
Garrioch, Sydney	Manitoba Keewatinook Ininew Okimowin
Gilmore, Will	Manitoba Wildlands/Canadian Nature Federation
Graham, Lloyd	O-Pinon-Na-Piwin Cree Nation
Hannon, Gord	Manitoba Justice
Hardess, Lisa	Community Association of South Indian Lake
Harper, William	Consumers Association of Canada/Manitoba Society of Seniors
Hart, Charles	Private
Hart, Nelson	Private
Hicks, David	Manitoba Hydro/Nisichawayasihk Cree Nation
Hicks, Elizabeth	Manitoba Hydro/Nisichawayasihk Cree Nation
Higgin, Roger	Consumers Association of Canada/Manitoba Society of Seniors
Hilliard, Rob	Manitoba Federation of Labour
Hopper, Gary	The Town of The Pas
Hornung, Robert	Manitoba Wildlands/Canadian Nature Federation
Hreno, Trent	Manitoba Conservation
Johnston, Tim	North Central Development
Keating, Sean	Mosakahiken Cree Nation
Kempton, Kate	Pimicikamak Cree Nation
Kidd, Scott	Private
Kobliski, Carol	Displaced Residents of South Indian Lake
Krentz, Bruce	Norman Regional Development Corporation
Kubly, Gary	Manitoba Wildlands/Canadian Nature Federation
Kuczek, Lloyd	Manitoba Hydro/Nisichawayasihk Cree Nation
Kulchyski, Peter	Manitoba Wildlands/Canadian Nature Federation
Lawrenchuk, Mike	Fox Lake Cree Nation
Leonoff, Heather	Manitoba Justice
Linklater, Darcy	Private
MacInnes, Campbell	Manitoba Hydro/Nisichawayasihk Cree Nation

MacKenzie, Doug	Tataskweyak Cree Nation
Martin, David	Manitoba Building and Construction Trades Council
Matthews Lemieux, Valerie	Manitoba Hydro/Nisichawayasihk Cree Nation
May, Elizabeth	Manitoba Wildlands/Canadian Nature Federation
Mayham, Zack	Fox Lake Cree Nation
Mazur, Ron	Manitoba Hydro/Nisichawayasihk Cree Nation
McCully, Patrick	Manitoba Wildlands/Canadian Nature Federation
McIvor, Donald	Trapline #18
McIvor, Greg	Trapline #18
McMahon, Blair	Manitoba Hydro/Nisichawayasihk Cree Nation
Meade, Reg	Northern Association of Community Councils
Mercredi, Eugenie	Pimicikamak Cree Nation
Miller, Peter	Time to Respect Earth's Ecosystems/Resource Conservation Manitoba
Montgomery, Darryl	Manitoba Metis Federation
Moore, Billy	Private
Moore, Frank	Displaced Residents of South Indian Lake
Moore, Willie	Nine Youth Members of Nisichawayasihk Cree Nation
Morriseau, John	Manitoba Metis Federation
Murphy, Eamon	Manitoba Wildlands/Canadian Nature Federation
Murphy, Jim	Operating Engineers of Manitoba
Neckoway, Ramona	Private
Nichols, Jim	Manitoba Wildlands/Canadian Nature Federation
Osborne, William	Pimicikamak Cree Nation
Osler, Cam	Manitoba Hydro/Nisichawayasihk Cree Nation
Phare, Merrell-Ann	Community Association of South Indian Lake
Pierce, Stu	Manitoba Justice
Pollitt-Smith, Mona	Consumers Association of Canada/Manitoba Society of Seniors
Primrose, Jerry	Nisichawayasihk Cree Nation
Rempel, George	Manitoba Hydro/Nisichawayasihk Cree Nation
Rudnicki, Tim	Manitoba Wildlands/Canadian Nature Federation
Schaefer, James	Boreal Forest Network
Schroeder, Wayne	INCO Thompson
Shaffer, Marvin	Manitoba Hydro/Nisichawayasihk Cree Nation
Sinclair, Peter	Pukatawagan Fisherman's Association
Soprovich, Dan	Manitoba Wildlands/Canadian Nature Federation
Spence, Jimmy	Private
Spence, Rodney	Private

Spence, Victor	Tataskweyak Cree Nation
Spence, Wellington	Private
Starmer, Graham	Winnipeg and Manitoba Chambers of Commerce
Strachan, Larry	Manitoba Conservation
Sullivan, Don	Boreal Forest Network
Swan, Margaret	Southern Chiefs Organization
Teillet, Jean	Manitoba Metis Federation
Thomas, Elvis	Manitoba Hydro/Nisichawayasihk Cree Nation
Topping, Steve	Manitoba Water Stewardship
Torrie, Ralph	Time to Respect Earth's Ecosystems/Resource Conservation Manitoba
Troniak, Dennis	Displaced Residents of South Indian Lake
Troniak, Eric	Displaced Residents of South Indian Lake
Trottier, Rachelle	Private
Turner, Bill	Manitoba Industrial Power Users Group
Turner, Frank	Swampy Cree Tribal Council
Wall, Bob	Thompson Chamber of Commerce
Wapaskokimaw, Gordon	Displaced Residents of South Indian Lake
Wavey, Robert	Fox Lake Cree Nation
Whelan Enns, Gaile	Manitoba Wildlands/Canadian Nature Federation
White Bird, Dennis	Assembly of Manitoba Chiefs Secretariat Inc.
Williams, Byron	Consumers Association of Canada/Manitoba Society of Seniors
Wojczynski, Ed	Manitoba Hydro/Nisichawayasihk Cree Nation
Wray, Carolyn	Manitoba Hydro/Nisichawayasihk Cree Nation

Appendix C
Financial Data

Wuskwatim Project Sensitivity Analysis	
Sequence Assumptions	**IRR**
A. Wuskwatim Long-Term Economics – Expected	10.3%
B. Wuskwatim Advancement (2009 vs. 2020) – Expected	10.3%
Low and High Export Price Forecasts	
C. LOW Export Price Forecast	8.0%
D. HIGH Export Price Forecast	12.1%
Reference and Environmental Export Price Forecast	
E. Reference Forecast (no Environmental Export Premium)	9.2%
F. LOW Environmental Export Premium Forecast	10.2%
G. MEDIUM Environmental Export Premium Forecast	10.9%
H. HIGH Environmental Export Premium Forecast	11.4%
Sensitivities	
I. Capital Cost INCREASE of 15% ($95-million)	9.2%
J. Capital Cost DECREASE of 15% ($95-million)	11.7%
K. 10% Flow Reduction on Burntwood River at Wuskwatim	9.8%
L. +300 MW Interconnection Capacity Adjustment	10.5%
M. -300 MW Interconnection Capacity Adjustment	10.0%
Implications of One Year Delay	
N. Wuskwatim 2010 ISD with added costs during delay (NPV cost of $28.4-million, 2002 present value dollars)	10.2%
Sequence Assumption	
B. Wuskwatim Advancement (2009 vs. 2020) – Expected Export Prices	10.3%
O. LOW export Price Forecast	8.5%
P. HIGH Export Price Forecast	12.3%
Reference and Environmental Export Price Forecasts	
Q. Reference Forecast (No environmental Export Premium)	9.6%
R. LOW Environmental Export Premium Forecast	10.4%
S. MEDIUM Environmental Export Premium Forecast	11.0%
T. HIGH environmental Export Premium Forecast	11.5%

Sensitivities to Wuskwatim Advancement – Expected Export Prices	
U. Impact of 250 MW of Wind (ISD – 2009)	10.25%
V. Impact of increasing (2X) DSM	10.25%
W. Combined impact of Wind in 2009 and increased DSM	10.2%
X. Impact of System Drought (i.e. 1987 to 91 drought repeating in 2009)	9.7%
Y. Impact of 2003 Power Resource Plan Update (Wuskwatim Advancement 2009 vs. 2019)	10.2%
Z. Wuskwatim 2010 ISD with added Costs during delay (NPV cost of $30.8-million, 2002 present value dollars)	10.0%
AA. Extreme downside combination of Low export price, 15% capital cost increase and 10% flow reduction	6.6%
Updated November 2003	
Wuskwatim 2010 advanced from 2019 – Expected Export Price	10.0%
Wuskwatim 2010 advanced from 2019 – Low Export Price	8.2%
Wuskwatim 2010 advanced from 2019 – High Export Price	12.0%

Appendix D
Acronyms

Acronym	Explanation
"ac"	Alternating Current (ac)
"ACRES"	Acres Manitoba Limited (ACRES)
"AFP"	Augmented Flow Program (AFP)
"AIP"	Agreement in Principle (AIP)
"asl"	above sea level (asl)
"ATEC"	Atoskwin Training and Employment Centre
"BBR"	Both Belle Robb Limited (BBR)
"BFN"	Boreal Forest Network (BFN)
"BNA"	Burntwood Nelson Collective Agreement (BNA)
"CAC/MSOS"	Consumers Association of Canada/Manitoba Society of Seniors (CAC/MSOS)
"CASIL"	Community Association of South Indian Lake (CASIL)
"CCCT"	Combined-Cycle Combustion Turbine (CCCT)
"CEA Agency"	Canadian Environmental Assessment Agency (CEA Agency)
"CEC"	Manitoba Clean Environment Commission (CEC)
"cfs"	Cubic Feet per Second (cfs)
"CIER"	Centre for Indigenous Environmental Resources (CIER)
"CMAEAC"	Canada-Manitoba Agreement on Environmental Assessment Cooperation (CMAEAC)
"CNF"	Manitoba Wildlands – Canadian Nature Federation (CNF)
"CO2"	Carbon Dioxide (CO2)
"CPI"	Consumer Price Index (CPI)
"CRD"	Churchill River Diversion (CRD)
"CT"	Combustion Turbines (CT)
"DAL"	Duncan and Associates Ltd. (DAL)
"dc"	Direct Current (dc)
"DFO"	Department of Fisheries and Oceans (DFO)
"DG"	Distributed Generation (DG)
"DOE"	Department of Energy (DOE)
"DRSIL"	Displaced Residents of South Indian Lake (DRSIL)
"DSM"	Demand Side Management (DSM)

"ECS"	Econalysis Consulting Services (ECS)
"EIA"	Energy Information Administration (EIA)
"EIS"	Environmental Impact Statement (EIS)
"EMT"	Environmental Management Team (EMT)
"EPA"	Environmental Protection Agency (EPA)
"EPAct"	Energy Policy Act (EPAct)
"FLCN"	Fox Lake Cree Nation (FLCN)
"GDP"	Gross Domestic Product (GDP)
"GHG"	Greenhouse Gas (GHG)
"G.S."	Generation Station (G.S.)
"ha"	hectare
"HVDC"	High Voltage Direct Current (HVDC)
"IGCC"	Integrated Gasification Combined Cycle (IGCC)
"IRR"	Internal Rate of Return (IRR)
"ISD"	In-Service Date (ISD)
"kV"	Kilovolt (kV)
"LWR"	Lake Winnipeg Regulation (LWR)
"m^3/s"	Cubic Metres per Second (m^3/s)
"MAET"	Manitoba Advanced Education, Training and Youth (MAET)
"MAPP"	Mid-Continent Area Power Pool (MAAP)
"MCN"	Mosakahiken Cree Nation (MCN)
"MFFA"	Manitoba Future Forest Alliance (MFFA)
"MH"	Manitoba Hydro (MH)
"MIA"	Master Implementation Agreement (MIA)
"MIPUG"	Manitoba Industrial Power Users Group (MIPUG)
"MISO"	Midwest Independent Transmission System Operator, Inc. (MISO)
"MKO"	Manitoba Keewatinook Ininew Okimowin (MKO)
"MMF"	Manitoba Métis Federation (MMF)
"MW"	Megawatt (MW)
"NCN"	Nisichawayasihk Cree Nation (NCN)
"NFA"	Northern Flood Agreement (NFA)
"NFAAT"	Needs for and Alternatives to (NFAAT)
"NFC"	Northern Flood Committee (NFC)
"NOx"	Nitrogen Oxides (NOx)
"NPV"	Net Present Value (NPV)

"NUG"	Non-Utility Generation (NUG)
"OCN"	Opaskwaysak Cree Nation (OCN)
"OPCN"	O-Pinon-Na-Piwin-Cree Nation (OPCN)
"PAT"	Project Administration Team (PAT)
"PCN"	Pimicikamak Cree Nation (PCN)
"PCWM"	Provincial Council of Women of Manitoba ((PCWM)
"PDA"	Project Development Agreement (PDA)
"PFA"	Pukatawagan Fishermen's Association (PFA)
"PIP"	Public Involvement Plan (PIP)
"PPA"	Power Purchase Agreement (PPA)
"ppm"	parts per million (ppm)
"PUB"	Public Utilities Board (PUB)
"PV"	Present Value (PV)
"RIM"	Rate Impact Measure Test (RIM)
"RMA"	Resource Management Area (RMA)
"SCCT"	Simple-Cycle Combustion Turbine (SCCT)
"SSEA"	Site Selection and Environmental Assessment (SSEA)
"SO$_2$"	Sulfur Dioxide (SO$_2$)
"SOU"	Summary of Understanding (SOU)
"SSE"	Supply Side Enhancement (SSE)
"TAC"	Technical Advisory Committee (TAC)
"TCN"	Tataskweyak Cree Nation (TCN)
"TEK"	Traditional Ecological Knowledge (TEK)
"TK"	Traditional Knowledge (TK)
"TREE/RCM"	Time to Respect Earth's Ecosystems/Resource Conservation Manitoba (TREE/RCM)
"TRC"	Total Resource Cost Test (TRC)
"TSK"	Traditional Scientific Knowledge (TSK)
"TSS"	Total Suspended Solids (TSS)
"U.S."	United States of America (U.S.)
"VEC"	Valued Environmental Component (VEC)
"WACC"	Weighted Average Cost of Capital (WACC)
"WPPI"	Wind Power Production Incentive (WPPI)
"WSK"	Western Scientific Knowledge (WSK)
"YFFN"	York Factory First Nation (YFFN)

Appendix E
Glossary

Aboriginal community: A community where most of the residents are Aboriginal (i.e. Indian, Métis or Inuit) and that has a separate form of government, provides some level of service to its residents, and has clear community boundaries (MH/NCN).

Above sea level (asl): Elevations referenced to Geodetic Survey of Canada, Canadian Geodetic Vertical Datum 1928, 1871 Local Adjustment.

Action: Any project or activity of human origin (CEAA).

Activity: Any action that is not a physical work. Activities do not involve the construction of an object and may lead to an environment effect.

Adaptive management: A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Adaptive management employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.

Adverse effects: Negative effects on the environment and people that may result from a proposed project (MH/NCN).

Agreement-in-Principle (AIP): Agreement ratified by NCN and MH regarding possible future development of the Wuskwatim and Notigi projects, including the opportunity for NCN to invest in the ownership of the Wuskwatim generation project (MH/NCN).

Allied Hydro Council (AHC): A committee of representatives of the International and Local Unions whose members work on the Project. The AHC is the exclusive labor bargaining agent for negotiating and administering the Burntwood Nelson-Agreement.

Alternating Current (ac): The oscillating flow of electrical current. AC is the common household electrical current and is used in transmission lines (MH/NCN).

Assessment: An evaluation of a proposal to ensure that appropriate environmental management practices are incorporated into all components of the life cycle of a development (*The Environment Act*).

Augmented Flow Program (AFP): An annual amendment to the Churchill River Diversion 1973 Interim *Water Power Act* licence. It provides additional flexibility in the operation of the CRD.

Baseline environment: A description of the environmental, social and economic conditions at and surrounding a proposed action. The baseline environment is dynamic and changes over time, due to natural variations and human-caused actions. An environmental assessment predicts environmental effects in the future with the Project in place and when the environmental conditions may be different from the baseline that is assessed.

Biodiversity: The existence of a wide range of different species in a given area or during a specific period of time (MH/NCN).

Burntwood-Nelson Agreement (BNA): The collective bargaining agreement between the Hydro Project Management Association (HPMA), representing Manitoba Hydro management, and the unions of the Allied Hydro Council, representing workers, that will be in effect during the construction of the Project.

Capability: The energy output of a generating station or the integrated system under specified conditions for a given time interval (usually one year).

Capacity: The rated power output of a machine or power plant, or a transmission line's ability to transmit electricity at any instant, normally measured in kilowatts (kW) or megawatts (MW). Several terms are commonly used:

1. Maximum: the maximum output that can be achieved.
2. Nameplate: the maximum output specified by the manufacturer.
3. Dependable: the maximum output that can be reliably supplied coincident with the system peak load; and
4. Firm: based on the dependable capacity, unit availability and system characteristics.

Capacity factor: The ratio of the average power output over a given period of time to the maximum capacity.

Capital cost: The total investment needed to complete a project and bring it to a commercially operable status. The costs associated with construction of a new facility, improvement of an existing facility or the purchase of an existing facility.

Canadian Environmental Assessment Agency (CEAA): Federal agency responsible for administration of the *Canadian Environmental Assessment Act*.

Churchill River Diversion (CRD): Involved construction of a control structure at the outlet of Southern Indian Lake to divert a large portion of the Churchill River down the Rat/Burntwood rivers into the lower Nelson River at Split Lake to enhance power production at Kettle, Long Spruce and Limestone generating stations.

Class 2 Development: Any development that is consistent with the examples or the criteria or both set out in the regulations for class 2 developments and the effects of which are primarily unrelated to pollution or are in addition to pollution (*The Environment Act*).

Class 3 Development: Any development that is consistent with the examples or the criteria or both set out in the regulations for class 3 developments and the effects of which are of such a magnitude or which generate such a number of environmental issues that it is as an exceptional project (*The Environment Act*).

Climate Change: A change in climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (United Nations

Framework Convention on Climate Change).

Co-generation: The sequential production of mechanical or electrical energy and useful thermal energy (steam or hot water) from a single fuel source.

Combined-cycle combustion turbine: The combination of a gas turbine and a steam turbine in an electric generation plant. The waste heat from the gas turbine provides the heat energy for the steam turbine (CCCT).

Combined effects: The effects caused by various components of the same action (CEAA).

Commission (CEC): Manitoba Clean Environment Commission (*The Environment Act*).

Comprehensive study: An environmental assessment that is conducted pursuant to sections 21 and 21.1, and that includes a consideration of the factors required to be considered pursuant to subsections 16(1) and (2) of the *Canadian Environmental Assessment Act*.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada (Environment Canada).

Cumulative-effects assessment: An assessment of the incremental effects of an action on the environment when the effects are combined with those from other past, present and future actions (CEAA).

Cumulative environmental effect: Changes in the environment that are caused by an action in combination with the effects of other past, present and future human actions (Cumulative Effects Assessment Practitioners Guide).

Debt/equity ratio: A measure of the relative size of a company's debt to the value of its total worth. A 75:25 debt/equity ratio signifies that 75% of the assets of the company have been financed through debt and that 25% has been contributed by the owners. In the case of Manitoba Hydro, the sole source of the equity capital has been the retention of net earnings. Higher percentage levels of debt reduce the amount of investment required by the owners, but result in higher interest costs and increase the likelihood that earnings will not be adequate to cover interest expense.

Demand: The average value of power, over a specified interval of time that is required and used by the customers' equipment. The demand is usually expressed in kilowatts or megawatts.

Demand Side Management (DSM): Actions planned or undertaken to influence the energy consumption or demand. The demand side management programs adopted by utilities attempt to alter the amount and/or timing of customers' use of electrical energy to reduce demand and overall consumption (Also known as Power Smart – Manitoba Hydro is a licensee of the Official Mark).

Dependable energy: The quantity of energy available to the Manitoba Hydro system under a repeat of the lowest historic flow conditions.

Development: Any project, industry, operation or activity, or any alteration or expansion of any project, industry, operation or activity which causes or is likely to cause:

a) the emission or discharge of any pollutant to the environment, or

b) an effect on any unique, rare or endangered feature of the environment, or

c) the creation of by-products, residual or waste products not regulated by *The Dangerous Goods Handling and Transportation Act*, or

d) A substantial utilization or alteration of any natural resource in such a way as to preempt or interfere with the use or potential use of that resource for any other purpose, or

e) A substantial utilization or alteration of any natural resource in such a way as to have an adverse effect on another resource, or

f) The utilization of a technology that is concerned with resource utilization and that may induce environmental damage, or

g) A significant effect on the environment or will likely lead to a further development which is likely to have a significant effect on the environment, or

h) A significant effect on the social, economic, environmental health and cultural conditions that influence the lives of people or a community insofar as they area caused by environmental effects (*The Environment Act*).

Direct Current (dc): Electric current that flows in one direction only. It is the form of current produced by a battery (MH/NCN).

Direct effect: An effect in which the cause-effect relationship has no intermediary effects (CEAA).

Discount rate: The interest used to convert future costs or benefits to their present value. A measure of a preference of receiving a benefit now or some time in the future. (see Real Discount Rate and Weighted Average Cost of Capital.)

Ecosystem: A functional unit consisting of all living organisms in a given area, and all non-living physical and chemical factors of the environment linked together through nutrient cycling and energy flow.

Efficiency: The effective rate of conversion of a natural resource to useable energy and capacity.

Electric current: The flow of charged particles (electrons) through a conductor such as a cable.

Endangered: A species facing imminent extirpation or extinction (COSEWIC).

Energy: The ability to do work. Electrical utilities sell electrical energy to their customers who, in turn, convert this energy into a desirable form – such as work, heat, light or sound. Electrical energy is measured in KW.h, MW.h, and GW.h.

Energy capability: The assured amount of energy that a generating plant can produce in a given time period (usually one year).

Engineering economics: Process of identifying alternative ways of using monetary resources to achieve an objective (such as producing energy) by applying mathematical concepts and models which fairly compare those alternatives, even though they may exhibit significant differences in magnitude and timing of capital, operating and other costs and benefits.

Environment: The components of the Earth, and includes a: land, water and air, including all layers of the atmosphere, b) all organic and inorganic matter and living organisms, and c) interacting natural systems that include components referred to in paragraphs a) and b). (*Canadian Environmental Assessment Act*).

Environment: a) air, land and water, or b) plant and animal life, including humans (*The Environment Act*)

Environmental assessment: An assessment of the environmental effects of the project that is conducted in accordance with this Act and the regulations (*Canadian Environmental Assessment Act*).

Environmental assessment: A systematic process of identifying, predicting, assessing the environmental effects of proposed undertakings before irrevocable decisions are made.

Environmental effect: a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*, b) any effect of any change referred to in paragraph (a) on (i) health and socio-economic conditions, ii) physical and cultural heritage, iii) the current use of lands and resources for traditional purposes by aboriginal persons, and iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or c) any change to the project that may be caused by the environment (*Canadian Environmental Assessment Act*).

Environmental Impact Statement (EIS): A document setting out the results of an environmental assessment including adverse and beneficial effects of a proposed development. The EIS is filed as part of an application for environmental approvals under *The Environment Act* and for public reviews under the *Canadian Environmental Assessment Act*.

Environmental Management System (EMS): The part of an organization's overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organization's environmental policy.

Environmental Protection Plan (EPP): A plan to implement mitigation measures, monitoring, regulatory requirements, licence terms and conditions, public commitments, and other matters identified in the EIS, and includes responsibilities and reporting protocols.

Equity: The owner's investment in an enterprise, represented in the financial statement of utility as the value of outstanding and preferred stock, retained earnings (reserves), and any additional paid-in-capital.

Erosion: A volumetric reduction of shorelines by natural processes.

Erosion Rate: The net loss of shorelines normally located above the lake surface elevation over a specific period of time.

Firm export: The assured sale of a contracted amount of energy and/or capacity to utilities or customers located outside the boundaries of Manitoba.

Firm power: Power (electricity) that must be supplied as agreed upon contract, even under adverse conditions.

First Nation: The term that most Indian people in Canada use to refer to themselves.

Fish habitat: Spawning, nursery, rearing, food supply and migration areas upon which fish depend (*Fisheries Act*).

Fixed costs: Costs incurred regardless of the variability of the output of the energy resource.

Follow-up (program): A program for a) verifying the accuracy of the environmental assessment of a project, and b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project (*Canadian Environmental Assessment Act*)

Fragmentation: The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance. Eventually, remaining blocks may be too small to provide usable or effective habitat for a species (CEAA).

Gas turbine: A combustion turbine that converts the energy of hot compressed gases (produced by burning fuel in compressed air) into mechanical power. Often fired by natural gas or fuel oil.

Generating station: A structure that produces electricity. Hydroelectric generating stations normally include a complex of powerhouse, spillway, dam and transmission structures.

Generator: A machine that converts mechanical energy – such as a rotating turbine driven by water or steam or wind – into electrical energy.

Gigawatt (GW): One billion watts (1,000,000,000 watts) of electricity.

Gigawatt hour (GWh): The amount of electrical energy produced by one gigawatt of power over the period of one hour.

Greenhouse Gas (GHG): gases e.g., methane, carbon dioxide, chlorofluorocarbons emitted from a variety of sources and processes that contribute to global warming by trapping heat between the Earth and the upper atmosphere.

Hurdle rate: In capital budgeting, the minimum acceptable rate of return on a project. The hurdle rate is equal to marginal cost of capital, adjusted for the project's risk.

Hydroelectric: Electricity produced by converting the energy of falling water into electrical energy (i.e., at a hydro generating station).

Independent Power Producer (IPP): A privately owned electricity generating facility that may be connected to a utility's system to sell electricity.

Indicators: Anything that is used to measure the condition of something of interest. Indicators are often used as variables in the modeling of changes in complex environmental systems (CEAA).

Indirect effect: An effect in which the cause-effect relationship has intermediary effects. As an interaction with another action's effects is required to have a cumulative effect, cumulative effects may be considered as indirect (CEAA).

In-service cost: The total cost to build a project, including the capital cost in constant dollars, plus price escalation between the date of the estimate and the date of actual expenditures, plus capitalized interest to reflect the opportunity cost of funds utilized or the cost of actual borrowings for the project, plus the transfer-in of pre-project design and study costs that have not otherwise been recovered through amortization.

Integrated system: The interconnected network of transmission lines, distribution lines and substations linking generating stations to one another and to customers throughout the electric system.

Interaction matrix: Table comparing interactions between project activities and environmental components or attributes. Interactions denote a cause-effect relationship which must be described as a change in the environment to be an effect. Effects may be assessed qualitatively or quantitatively.

Interconnections: Powerlines that interconnect one electrical utility's power system with another. Interconnections facilitate the export and import of power.

Interest: The charge or cost of using money expressed as an annual percentage rate.

Interest coverage: A measure of the safety margin by which earnings before interest expense exceed period interest costs. When expressed as a ratio, a value of 1.15 indicates that net revenue could decline by no more than 15% due to revenue decreases and/or cost increases before there would be insufficient earnings to pay interest costs. A ratio of less than 1 indicates that the company will have to borrow more money to pay its interest expense.

Internal rate of return: The rate of return of an asset investment, calculated by finding the discount rate at which the present value of revenue cashflows equals the present value of cost cashflows.

Kilovolt (kV): The unit of electrical pressure, or force, equivalent to 1000 volts (V).

Kilowatt (kW): The unit of electrical power equivalent to 1000 watts (W).

Kilowatt-hour (kW.h): The unit by which electrical energy is measured. For example, 10, 100-W light bulbs switched on for one hour would use one kilowatt-hour (1000 W one hour).

Lake Winnipeg Regulation (LWR): Series of structures that allows the regulation of Lake Winnipeg water levels to enhance power production on the lower Nelson River. LWR consists of channel excavations, Jenpeg generating station and Kiskitto Lake dam.

Large dam: According to the International Commission on Large Dams (2000), a large dam is one that fulfils at least one of the following criteria:

- Higher than 15 m
- Higher than 10 m but with a crest length of more than 500 m
- Has more than 1 Mm^3 storage capacity
- Has more than 2,000 m^{3}s-1 spilling capacity
- Has special foundation problems or is of unusual design

Levelized energy costs: The present value of the net cost (including capital, operating costs and any other fixed and variable costs) of a particular generation alternative divided by the present value of the average energy produced by that generation alternative over its economic life, expressed in cents per kilowatt hour or dollars per megawatt hour.

Linkage: The relationship between a cause and effect in impact models. Linkages are illustrated in pathway diagrams as arrows between boxes.

Load: The amount of power that needs to be generated to supply demand.

Load factor: The ratio of the average load supplied during a given period to the maximum load occurring during the same period.

Local region: A study region identified as part of the socio-economic assessment for the Wuskwatim generation project. Boundaries of the local region are largely defined by the Nelson House RMA and include the Northern Affairs community of South Indian Lake (MH/NCN).

Local study area: The spatial area within which local effects are assessed or within close proximity to the action where direct effects are anticipated (CEAA).

Losses (transmission line): Energy lost as heat in electrical equipment and along transmission lines as electricity is transferred from one location to another.

Low-head dam: A dam at which the water in the reservoir is not high above the turbine units.

Marginal cost: The incremental cost saving associated with an incremental decrease in load or an incremental increase in supply which would result in a changed future utility system expansion and operation. This is used as a measure for evaluating individual DSM and supply options.

Megawatt (MW): The unit of power equivalent to 1,000,000 watts.

Megawatt hour (MWh): The amount of electrical energy produced by one megawatt of power over the period of an hour.

Mid-Continent Area Power Pool (MAPP): An association of electric utilities and other electric industry participants in the Upper Midwest United States.

Mitigation: The elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means (*Canadian Environmental Assessment Act*).

Modified run-of-the-river: A mode of operation that is based on modest flow changes that allow efficient generation, but is restricted so that the outflow pattern does not cause excessive downstream water-level fluctuations. Generally, the daily average outflow is equal to the daily average inflow (MH/NCN).

Monitoring: A continuing assessment of conditions at and surrounding the action. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted (CEAA).

NCN-NFA Implementation Agreement (1996): The agreement signed by NCN, MH, Canada and Manitoba to implement the 1977 NFA and to resolve most, although not all, outstanding claims stemming from the CRD.

Nearshore: An indefinite zone extending lakeward from the average annual water level to beyond breaker zone defining the area of nearshore currents formed primarily by wave action.

Net Present Value (NPV): A method of ranking investment proposals. The NPV is equal to the present value of future cashflows, minus the present value of all costs, discounted as the marginal cost of capital.

Non Utility Generation (NUG): Electrical power produced by an enterprise which is not an electrical utility. The energy may be used to supply the producers' own needs or sold to a utility.

Northern Flood Agreement (NFA): A 1977 agreement between Canada, Manitoba, MH and the Northern Flood Committee. The NFA allowed the participating First Nations and their members to claim compensation for the adverse effects of the CRD and LWR projects and any future developments by MH arising from these projects (MH/NCN).

Off-the-Shelf: Export forecast purchased with no customization for MH.

Pathway: A series of consecutive valid linkages in a pathway diagram (CEAA)

Pathway diagram: A simple diagrammatic representation of a cause-effect relationship between two related states or actions that illustrates an impact model. Pathway diagrams take linkage diagrams one step further by evaluating each linkage and assessing the cause-effect relationship in the context of a scientific hypothesis (CEAA).

Peak demand: The maximum instantaneous demand experienced by a power system averaged over a given period of time, usually one hour.

Plankton: The collection of small or microscopic organisms, including algae and protozoans, that float or drift in great numbers in fresh or salt water, especially at or near the surface, and serve as food for fish and other larger organisms.

Portfolio Approach: A range of alternatives to achieve the same objective, whereby each alternative combines different sequences of energy sources (that is, varying combinations of hydroelectric, wind, supply-side enhancements, and demand-side management.)

Power: The rate of using electrical energy, usually measured in watts, kilowatts, megawatts, or gigawatts.

Precautionary Principle: This principle says that whenever there is reasonable suspicion of harm, lack of scientific certainty should not be used as an excuse to preclude preventative action (Rio Declaration 1992).

Present value: The worth of future receipts or costs expressed in current value. To obtain present value, a discount rate is used to discount future revenues or costs.

Project: a) In relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work, or b) any proposed physical activity not relating to a physical work that is prescribed or is within a class of physical activities that is prescribed pursuant to regulations made under paragraph 59(b) (*Canadian Environmental Assessment Act*).

Project Administration Team (PAT): Team of senior representatives from the Government of Canada and Manitoba Conservation that have environmental assessment responsibilities with respect to a project under the Canada-Manitoba Agreement on Environmental Assessment Cooperation.

Project Development Agreement (PDA): A legally binding agreement between NCN and MH that outlines the obligations of signatory parties should the Wuskwatim generation project proceed. The PDA will cover many issues including partnership arrangements, training, employment and business opportunities, water regime and compensation (MH/NCN).

Project footprint: The land and/or water covered by a project. This includes direct physical coverage and direct effects (CEAA).

Proponent: A person who is undertaking, or proposes to undertake a development or who has been designated by a person or group of persons to undertake a development in Manitoba on behalf of that person or group of persons (*The Environment Act*).

Public Involvement Plan (PIP): A plan developed by MH and NCN outlining their approach to public involvement for the Wuskwatim generation and transmission projects (MH/NCN).

Public Utilities Board (PUB): A regulatory body appointed by the Government of Manitoba that has regulatory authority over Manitoba Hydro's rates charged to Manitoba consumers.

Qualitative analysis: Analysis that is subjective (CEAA).

Quantitative analysis: Analysis that uses environmental variables represented by numbers or ranges, often accompanied by numerical modeling or statistical analysis (CEAA).

Real dollars: Dollar values from which the effect of inflation has been removed, such that the dollars are constant with respect to a given year (or base year). Also known as base or constant dollars.

Recession: A landward retreat of the shoreline structure or cliff.

Region: Any area in which it is suspected or known that effects due to the action under review may interact with effects from other actions. This area typically extends beyond the local study area; however, how far it extends will vary greatly depending on the nature of the cause-effect relationships involved (CEAA).

Regional study area: The spatial area within which cumulative effects are assessed (CEAA).

Residual environmental effect: The net environmental effect remaining after the application of mitigation measures for elimination, reduction or control of the adverse environmental effect.

Resource Management Area (RMA): An area to be jointly managed by a Resource Management Board established by agreement between Manitoba and a First Nation or a local Aboriginal community (MH/NCN).

Responsible Authority (RA): A federal authority that is required pursuant to subsection 11(1) to ensure that an environmental assessment of the project is carried out (*Canadian Environmental Assessment Act*).

Right-of-way (ROW): Area of land controlled or maintained for the development of a road, pipeline or transmission line.

Riparian: Along the banks of rivers and streams.

Run-of-the-river: A mode of operation of a generation station that passes the inflow and outflow with no flow changes as a result of the generation station operation (MH/NCN).

Scoping: A consultative process for identifying and possibly reducing the number of items to be examined only until the most important items remain for detailed assessment. Scoping ensures that assessment effort will not be expended in the examination of trivial effects (CEAA).

Screening: An environmental assessment that is conducted pursuant to section 18 and that includes a consideration of the factors set out in subsection 16(1) of the *Canadian Environmental Assessment Act*).

Sensitivity analysis: Simulation analysis in which key variables are changed one at a time and the resulting change in the rate of return is observed.

Significance: A measure of how adverse or beneficial an effect may be on a VEC (CEAA).

Simple-Cycle Combustion Turbine (SCCT): A turbine powered by natural gas or fuel oil in an electric generation plant. The waste heat from the gas turbine is exhausted and not utilized (see gas turbine).

Site Selection and Environmental Assessment (SSEA): Process used to select a site or route for a transmission facility and assess any potential environmental effects of that facility on the biophysical and socio-economic environment (MH/NCN).

Spatial boundary: An area examined in the assessment (CEAA).

Special concern: A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events (COSEWIC).

Standard environmental protection measures: Practices which MH has developed to use in the construction, operation and maintenance, and decommission of hydro-electric facilities (MH/NCN).

Strategic Environmental Assessment (SEA): An environmental assessment of a policy, plan and program proposal to incorporate environmental considerations into the development of public policies (CEAA).

Sunk costs: Expenditures that have already been committed or incurred, and therefore are excluded from the economic evaluation as they have no impact on the decision under consideration.

Sustainable development: Meeting the needs of the present without compromising the ability of future generations to meet their own needs (*The Sustainable Development Act*).

Sustainable development: Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (*Canadian Environmental Assessment Act*).

Technical Advisory Committee (TAC): Committee of government representatives that reviews and provides advice to Manitoba Conservation on licence proposals under *The Environment Act* licence proposals.

Temporal boundary: The period of time examined in the assessment (CEAA).

Threatened: A species likely to become endangered if limiting factors are not reversed (COSEWIC).

Threshold: A limit or level which if exceeded likely results in a noticeable, detectable or measurable change or environmental effect that may be significant. Example thresholds include water-quality guidelines, acute toxicity levels, critical population levels and wilderness criteria.

Total Suspended Solids (TSS): Solids present in water that can be removed by filtration consisting of suspended sediments, phytoplankton and zooplankton (MH/NCN).

Traditional Knowledge (TK): NCN considers Traditional Knowledge to be: the observation and experience of the land; Aboriginal law regarding how the environment works;

the understanding of NCN's place in the world – how things are connected, including spiritually, and the relationship to the land; the goals and aspirations of NCN; the outlook on the proposed Projects – concerns, acceptability; NCN's identity and culture; the stewardship of the land, and a basis for natural resource management. NCN believes that traditional knowledge comes from Elders and others, both traditional and modern (MH/NCN).

Traditional Ecological Knowledge (TEK): A component of Aboriginal traditional knowledge about the environment and the use of the environment. It is governed by community beliefs and values, and is an integral part of a community's social, cultural and spiritual framework. TEK is held by a community, although different segments of a community may hold different types of TEK. It is living knowledge. TEK is added to and subtracted from and therefore changes over time (CEAA).

Traditional Scientific Knowledge (TSK): Scientific knowledge held by Aboriginal or indigenous peoples around the world. It is based upon an intimate connection with the lands and waters, oral tradition since time immemorial, and draws upon the people's spiritual connectedness to the land.

Transmission system: The towers and conductors that transport electricity in bulk form from a source of supply to either local areas for distribution, or to power systems of out-of-province electrical utilities. Electricity is usually transported via transmission lines at voltages ranging from 66 kV to 500 kV.

Undercut: Undermining, erosion of the lower part of a steep bank so as to reduce the stability of the upper part.

Valued Environmental Component (VEC): Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern (*Cumulative Effects Assessment Practitioners Guide*).

Volt (V): The unit of measurement of electric pressure which causes current to flow (MH/NCN).

Watt (W): The unit of measurement of electrical power (MH/NCN).

Weighted Average Cost of Capital (WACC): The marginal costs of debt and equity weighted by the target proportions of debt and equity in the total capital structure.

Western Scientific Knowledge (WSK): Scientific knowledge accumulated by systematic study using what is described as the scientific method and organized by general principles.

Wind-Eliminated Water Levels: The lake level when the effects of wind are eliminated.